DVD-Video Recorder

DVD+RW Basic Engine

VAE8015
VAE8020

Service
Service
Service

Service Manual

CLASS 1
LASER PRODUCT

DVD+ReWritable

DIGITAL VIDEO

DIGITAL AUDIO

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1. Technical Specifications

VAE8015/VAE8020 functionality:

- Loading of 8 cm and 12 cm discs by a motorized tray
- Disc type recognition and in case of a DVD+RW disc laser power calibration
- Servo control for disc rotation, sledge movements, tilt, focus and actuator position
- EFM+ encoding / decoding for DVD, and EFM decoding for CD
- Writes and read DVD+RW discs and reads DVD, CD and CD-R/RW discs
- Linking control, header insertion and sector number updating at record
- Interfacing to the MPEG back-end (S2B) for control and (I2S and V4) for data
- The back-end has to provide MPEG data processing, data buffering, construction
- of logical format for Lead-in, Data area and Lead-out part of the DVD+RW dis

2. Safety Instructions, Warnings and Notes

2.1 Safety Instructions

2.1.1 General Safety

Safety regulations require that during a repair:
- Connect the unit to the mains via an isolation transformer.
- Replace safety components, indicated by the symbol ▲, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.

Safety regulations require that after a repair, you must return the unit in its original condition. Pay, in particular, attention to the following points:
- Route the wires/cables correctly, and fix them with the mounted cable clamps.
- Check the insulation of the mains lead for external damage.
- Check the electrical DC resistance between the mains plug and the secondary side:
  1. Unplug the mains cord, and connect a wire between the two pins of the mains plug.
  2. Set the mains switch to the 'on' position (keep the mains cord unplugged!).
  3. Measure the resistance value between the mains plug and the front panel, controls, and chassis bottom.
  4. Repair or correct unit when the resistance measurement is less than 1 MΩ.
  5. Verify this, before you return the unit to the customer/ user (ref. UL-standard no. 1492).
  6. Switch the unit 'off', and remove the wire between the two pins of the mains plug.

2.1.2 Laser Safety

This unit employs a laser. Only qualified service personnel may remove the cover, or attempt to service this device (due to possible eye injury).

Laser Device Unit

Type	:	Semiconductor laser GaAlAs
Wavelength	:	650 nm (DVD)
	:	780 nm (VCD/CD)
Output Power	:	20 mW (DVD+RW writing)
	:	0.8 mW (DVD reading)
	:	0.3 mW (VCD/CD reading)
Beam divergence	:	60 degree

Figure 2-1 Class 1 Laser Product

Note: Use of controls or adjustments or performance of procedure other than those specified herein, may result in hazardous radiation exposure. Avoid direct exposure to beam.

2.2 Warnings

2.2.1 General

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD, symbol ⚠). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are at the same potential as the mass of the set by a wristband with resistance. Keep components and tools at this same potential. Available ESD protection equipment:
  – Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
  – Wristband tester 4822 344 13999.
- Be careful during measurements in the live voltage section. The primary side of the power supply (pos. 1005), including the heatsink, carries live mains voltage when you connect the player to the mains (even when the player is 'off'!). It is possible to touch copper tracks and/or components in this unshielded primary area, when you service the player. Service personnel must take precautions to prevent touching this area or components in this area. A 'lightning stroke' and a stripe-marked printing on the printed wiring board, indicate the primary side of the power supply.
- Never replace modules, or components, while the unit is 'on'.

2.2.2 Laser

- The use of optical instruments with this product, will increase eye hazard.
- Only qualified service personnel may remove the cover or attempt to service this device, due to possible eye injury.
- Repair handling should take place as much as possible with a disc loaded inside the player.
- Text below is placed inside the unit, on the laser cover shield:

CAUTION VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID EXPOSURE TO BEAM
ADVARSEL SYNLIG OG USYNLIG LASERSTRÅLING VED ÅBNING UNDGÅ UDSÆTTELSE FOR STRÅLING
ADVARSEL SYNLIG OG USYNLIG LASERSTRÅLING NÅR DEKSEL ÅPNES UNNGÅ EKSPONERING FOR STRÅLEN
VARNING SYNLIG OCH OSYNLIG LASERSTRÅLNING NÄR DENNA DEL ÄR ÖPPNAD BETRAKTA EJ STRÅLEN
VARO! AVATT AESSA OLET ALTTIINA NÄKYMÄTTÖMÄLLE LASER SÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN
VORSICHT SICHTBARE UND UNSICHTBARE LASERSTRAHLUNG WENN ABDECKUNG GEÖFFNET NICHT DEM STRAHL AUSSETSEN
DANGER VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID DIRECT EXPOSURE TO BEAM
ATTENTION RAYONNEMENT LASER VISIBLE ET INVISIBLE EN CAS D'OUVERTURE EXPOSITION DANGEREUSE AU FAISCEAU

Figure 2-2 Warning text

Table 2-1 Configuration matrix - Basic Engines VAE 8015 and VAE 8020

Item	Description		VAE8015/01	VAE8015/02	VAE8020/01	VAE8020/02	VAE8020/03	VAE8020/05	VAE8020/15 Glass Lens OPU	VAE8020/15 Plastic Lens OPU	Remark
0068	**Sledge Motor**		3104 147 17481	3104 147 17481	3104 147 17481	3104 147 17481	3104 147 17481	3104 147 17481	3104 147 17481	3104 147 17481	Same for all
001	**Loader Assy**		3104 147 17471	3104 147 17471	3104 147 17471	3104 147 17471	3104 147 17471	3104 147 17471	3104 147 17471	3104 147 17471	Same for all
0011	**Fan**		3106 148 01780	3106 148 01780	3106 148 01780	3106 148 01780	3106 148 01780	3106 148 01780	3106 148 01780	3106 148 01780	
0100	**DVDM**	OPU Version in Production	9305 011 64643 (Ladic M3, glass lens)	9305 011 64644 (Ladic M3, glass lens)	9305 011 64643 (Ladic M3, glass lens)	9305 011 64644 (Ladic M3, glass lens)	9305 011 64101 (Ladic M4, glass lens)	9305 011 64101 (Ladic M4, glass lens)	9305 011 64101 (Ladic M4, glass lens)	9305 011 64111 (Ladic M4, plastic lens)	See remark 3
		Service Replacement DVDM	9305 022 82001 DVDM/01 (Ladic M3, glass	9305 022 82002 DVDM/02 (Ladic M3, glass	9305 022 82015 DVDM/15 (Ladic M4, Plastic Lens)						
0002	**PCBA**	Production Version	3104 128 08262 3104 128 08261	3104 128 08262 3104 128 08261	3104 128 08322 3104 128 08321	3104 128 08322 3104 128 08321	3104 128 08322	3104 128 08881 3104 128 08861	3104 128 008861	3104 128 008861	See remark 1, 2
		Service Replacement	3104 128 08262 (with Awesome 1)		3104 128 08322 (with Awesome 2)			3104 128 08861 (with Awesome 3)			
		PCB Layout Version	3104 123 4301.x	3104 123 4301.x	3104 123 4335.x	3104 123 4335.x	3104 123 4335.x	3104 123 4366.x	3104 123 4366.x	3104 123 4366.x	
0010	**Tilt motor**		3105 148 01520	3105 148 01520	3105 148 01520	3104 148 01520	3104 148 01520	3104 148 01520	3104 148 01520	3104 148 01520	Same for all
0046	**OPU rack sledge**		3104 144 07244	3104 144 07244	3104 144 07244	3104 144 07244	3104 144 07244	3104 144 07244	3104 144 07244	3104 144 07244	Same for all
0047	**OPU rack spring**		3104 141 22833	3104 141 22833	3104 141 22833	3104 141 22833	3104 141 22833	3104 141 22833	3104 141 22833	3104 141 22833	Same for all
0054	**OPU flex**	Production Version	3104 143 30532 3104 157 12392	3104 143 30532 3104 157 12392	3104 143 30532 3104 157 12392	3104 143 30532 3104 157 12392	3104 143 30532 3104 157 12392	3104 143 30532 3104 157 12392	3104 157 12392	3104 157 12392	Same for all
		Service Replacement	3104 157 12392								
	Firmware	Production Version	15.07.12	15.07.12	20.09.13	20.09.13	20.01.18	20.02.21	20.02.21	20.02.21	See remark 3
		Service Version for Glass Lens	15.07.21		20.01.21			20.02.21		-	
		Service Version for Plastic Lens DVDM/15			20.03.23						

Remarks:

Remark 1: The combination of Awesome1 (VAE8015 PCB) and LadicM4 (OPU6410, OPU6411) is not feasible.

Remark 2: Old VAE8020 PCBs 08322 have mounted Awesome-2. It is allowed to replace this with current VAE8020 PCB's (08861) mounted with Awesome-3.

Remark 3: If VAE8020/01 /02 /03 /05 /15 products with glass lens OPU are repaired with DVDM/15 (with 64111 OPUs with plastic lens) the Firmware has to be updated to 20.03.23.

Use special Upgrade Software in this case!

3. Directions For Use

Not applicable

4. Mechanical Instructions

Index of this chapter:
1. General
2. Disassembly
3. Re-assembly

Note: Figures below can deviate slightly from the actual situation, due to the different set executions.

4.1 General

- Follow the disassemble instructions in described order.
- Do not place the unit with its PWB on a hard surface (e.g. table), as it could damage the components on it. Always place something soft (a towel or foam cushion) under it.
- Never touch the lens of the laser.
- Take sufficient ESD measures during (dis)assembly.

4.2 Disassembly

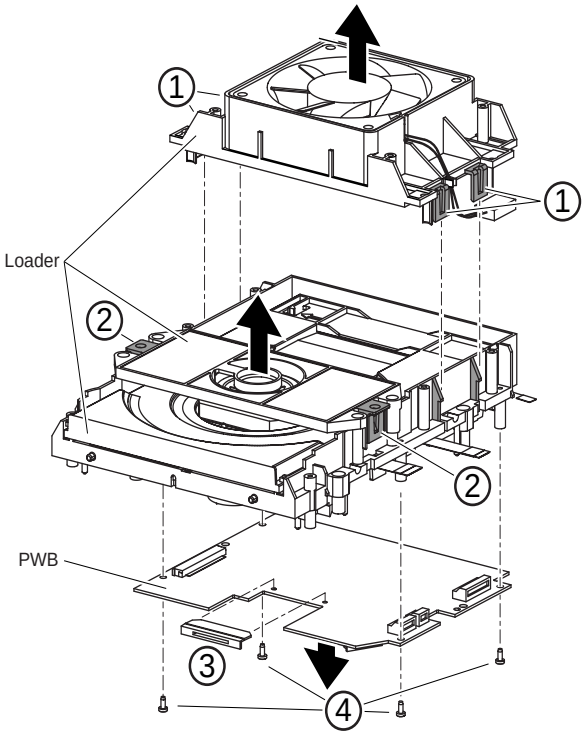


Figure 4-1 Basic Engine disassembly (part 1)

You can divide the Basic Engine into the following parts:
1. Loader (fan, clamp, and tray assy).
2. PWB (or 'mono board').
3. DVD-Module (OPU, turntable motor, and sledge-motor assy).

4.2.1 Loader

1. Disconnect the 2-wire fan cable from the PWB.
2. Remove the fan assy, by releasing the four side clamps [1] while moving it upwards.
3. Remove the clamp assy, by releasing the two side clamps [2] while moving it upwards.

4.2.2 PWB

1. Flip the module180 degrees, so you can access the PWB.
2. Disconnect the four flex foils from the PWB connectors (1100, 1300, 1302, and 1303) at the component side. For the flex foil on connector 1100, you first must remove the cable clamp [3]. The easiest way to do this is to push down the two fixation pins of the clamp (via the holes in the PWB) by means of a pencil or small screwdriver.
3. Disconnect the remaining cables (tray- and fan-motor cable) at the solder side of the PWB
4. Remove the four screws (Torx 8) that hold the PWB [4].
5. Now you can remove the board.

4.2.3 DVD-M

Caution: Never try to align the DVD-Module! ! ! Only the factory can do this properly. Service engineers are only allowed to exchange the sledge motor assy.

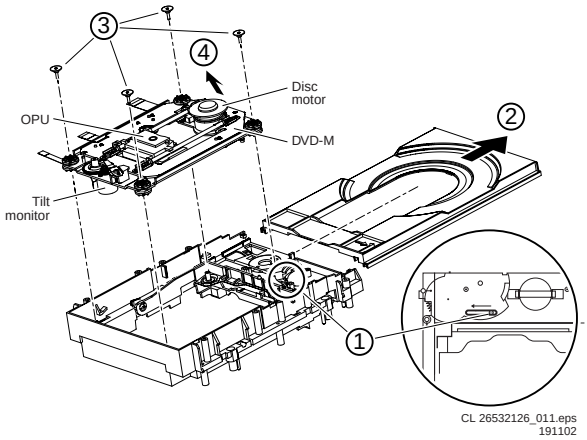


Figure 4-2 Basic Engine disassembly (part 2)

1. Slide the 'tray pin' in the direction of the arrow [1], in order to release the disc tray.
2. Flip the module180 degrees and pull out the tray [2]. Now you can access the DVD-Module.
3. Remove the four screws [3] with a Torx 6 screwdriver, and lift the DVD-M upwards [4] at the side of the disc-motor. It hinges in the bracket at the side of the tilt-motor.

4.2.4 Sledge-motor Assy

Caution: Never try to align the DVD-Module! ! ! Only the factory can do this properly. Service engineers are only allowed to exchange the sledge motor assy.

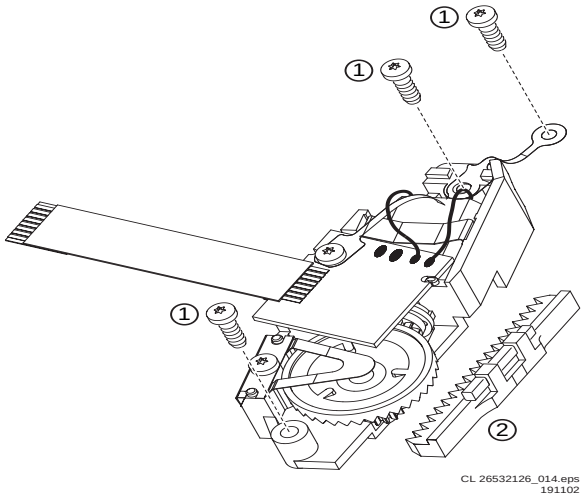


Figure 4-3 Sledge-motor assy

1. Place the DVD-Module, with the laser facing downwards, on a soft surface.
2. Remove the three screws [1] that hold the sledge-motor assy, and lift the assy upwards. You can replace it now.
3. If necessary, it is now also possible to replace the sledge-rack [2] that is hinged in the sledge assy.

4.3 Re-assembly

To re-assemble the module, do all processes in reverse order.

Be sure to:

- **Sledge-motor assy:** Mesh the teeth of the sledge motor and sledge rack properly, during mounting of the sledge-motor assy.
- DVD-M: Point the laser up (towards the tray), when you mount the DVD-M in the bracket.
- **Complete module:** Place all wires/cables in their original positions

5. Service Modes, Error Codes and Fault Finding

Index of this chapter:
1. General
2. Start-up Measurements
3. Diagnostic Software
4. Nuclei Error Codes
5. Fault Finding

5.1 General

- Impedance of measuring-equipment should be > 1 MOhm.
- For testing the Basic Engine, connect it to a DVD-recorder of the DVDR1000, 900, or 800 series.
- Most tests are done by software commands. Together with the software command you will find a Ref.# nbr. This is the number of the diagnostic nucleus used for this test. You can find information that is more detailed in the chapter 'Diagnostic Nuclei'.
- Levels: Most measurements are digital measurements. The signal levels specification in this document are defined as follows:
  - low < 0.3V
  - high > 3.0V
  - LOW < 0.4V
  - HIGH > 4.5V

5.2 Start-up Measurements

5.2.1 Power Supply Check

Table 5-1 Table of supply input voltages.

Signal	Test point	Description	Specifi-cations	Toler-ance	Unit
+3V3	I007	Input of supply	+3.3	1%	V
+5	I008	Input of supply	+5	1%	V
+4V6	I010	Input of supply	+4.6	1%	V
-5	I011	Input of supply	-5	1%	V
+12	I012	Input of supply	+2	1%	V
GND	I015, I016	Input of supply			

Table 5-2 Table of derived supply voltages.

Signal	Test point	Description	Specifi-cations	Toler-ance	Unit
D3V3	I006	Digital 3V3	+3.3	2%	V
A3V3	I007	Analogue 3V3	+3.3	2%	V
+5V	I008	Analogue 5V	+5	2%	V
D5V	I009	Digital 5V	+5	2%	V
+3V3E	F001	OPU 3V3	+3.3	2%	V
-5	I011	Neg. voltage	-5	2%	V
+12	I012	12V	+12	2%	V
Vbias	I014	Bias voltage	-1.7	2%	V
GND	I017, I018	Input of supply	0	0 %	V

The module operates in power 'off' and power 'on' only. There is no standby mode at module level. In power 'off', the module does not respond to any communication or signal.
Before starting the measurement, connect the power supply to the mono board via connector 1000, and the PC interface cable to the Service Interface connector of the 'test recorder'.

5.2.2 Oscillator Check

Table 5-3 Table of clock signals.

Signal	Test point	Descrip-tion	Spec.	Toler-ance	Unit
OSCOUT	I219	Ref. Clock MACE	8.483	+/- 70 kHz	MHz
CROUT	I443	Ref. Clock HDR65	8.501	+/- 70 kHz	MHz
PSEN	I223	OEN Flash ROM	5.324	+/- 70 kHz	MHz
RA/FO/SL	I326/I334/ I343	Servo clock	2.120	+/- 20 kHz	MHz

On the mono board, there are two external oscillators (OSCOUT and CROUT), which are the reference for all clock signals derived in several ICs.
To check whether the program (in the MACE microprocessor) is running after power 'on', you can monitor the PSEN (OEn of Flash ROM) on I223 (see test point overview in chapter 6).
You can measure the Servo clocks at I326 (RAdial), I334 (FOcus), and I343 (SLedge).

5.3 Diagnostic Software

Due to the complexity of a DVD recorder, the time to find a defect in the recorder can become long. To reduce this time, the recorder has been equipped with Diagnostic and Service software (DS). The DS offers functionality to diagnose the DVDR hardware and tests the following:
- Interconnections between components.
- Accessibility of components.
- Functionality of the audio and video paths.

This is also valid for the Basic Engine.

One can access this functionality via several interfaces:
1. End user/Dealer script interface.
2. Player script interface.
3. Command interface.
4. Menu interface (only for Digiboard Empress).

This part describes the command and menu interface.

First some definitions:
- **Diagnostic Nucleus.** Part of the Diagnostic Software. Each nucleus contains an atomic and software independent diagnostic test, testing a functional part of the DVD player hardware on component level.

5.3.1 Menu and Command Interface

Nuclei Numeration
Each nucleus has a unique number of four digits. This number is the input of the command mode.

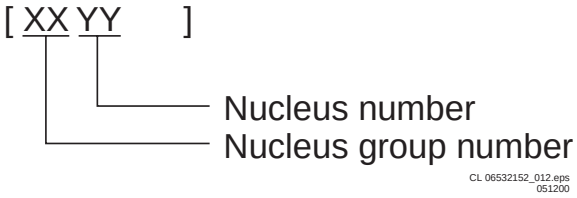


Figure 5-1 Nucleus code

Error handling

Each nucleus returns an error code. This code contains six numerals, which means:

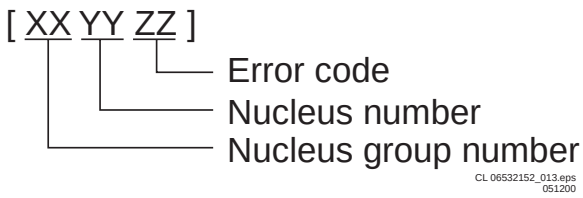


Figure 5-2 Error code

Hardware required

- Service PC.
- One free COM port on the Service PC.
- Special cable to connect DVD recorder to Service PC.

The service PC must have a terminal emulation program (e.g. HyperTerminal) installed and must have a free COM port (e.g. COM1).
Activate the terminal emulation program and check that the port settings for the free COM port are:

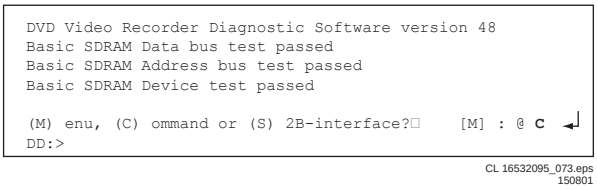
- 19200 bps,
- 8 data bits,
- No parity,
- 1 stop bit,
- No flow control.

Connect the free COM port via a special cable to the RS232 port of the DVD recorder. This special cable will also connect the test pin, which is available on the connector, to ground (i.e. activate test pin). Code number of PC interface cable: 3122 785 90017.

Command Mode Interface

Activation

Connect the recorder to the mains. The following text will appear on the screen of the terminal (program) for Digiboard Empress:


DVD Video Recorder Diagnostic Software version 48
Basic SDRAM Data bus test passed
Basic SDRAM Address bus test passed
Basic SDRAM Device test passed
(M) enu, (C) ommand or (S) 2B-interface? [M] : @ C
DD:>

CL 16532095_073.eps
150801

Figure 5-3 Opening screen for Digiboard Empress

The first line indicates that the Diagnostic software has been activated and contains the version number. The next lines are the successful result of the SDRAM interconnection test and the basic SDRAM test. The last line allows the user to choose between the three possible interface forms.
If pressing 'C' has made a choice for Command Interface, the prompt ("DD>") will appear. The diagnostic software is now ready to receive commands. The commands that can be given are the numbers of the nuclei.

Remark:
Digital Board Chrysalis always starts with Command Interface.

Command Overview

We provide an overview of the nuclei and their numbers. This overview is preliminary and subject to modifications. Please refer to the service manual of the set for the nucleus overview of Digital Board Chrysalis.

Table 5-4 Nuclei overview Basic Engine Empress Digiboard

Ref. #	Function name	Description
600	DS_BE_S2B_Pass	It switches the RS232 port and the S2B port in pass-through mode. This means that the player hangs. The only way to exit this nucleus is via a power off of the player
601	DS_BE_S2B_Engine	It checks the S2B interface with the Basic Engine by sending an 'echo' command
602	DS_BE_Version	It returns the version number of the Basic Engine
603	DS_BE_Reset	It resets the Basic Engine
604	DS_BE_FocusOn	It puts the laser of the basic engine into focus (focus loop)
605	DS_BE_FocusOff	It switches the focus loop off
606	DS_BE_DiscMotorOn	It switches the disk motor (= spindle motor) on
607	DS_BE_DiscMotorOff	It switches the disk motor (= spindle motor) off
608	DS_BE_RadialOn	It closes the radial loop
609	DS_BE_RadialOff	It opens the radial loop
615	DS_BE_TrayIn	It closes the disc tray
616	DS_BE_TrayOut	It opens the disc tray
617	DS_BE_WriteRead	It writes data to the BE which is stored on a DVD disc and read it back from the DVD disc. This is only done when the result of the self-test contains no errors.
618	DS_BE_WriteReadEndlessLoop	It writes data to the BE which is stored on a DVD disc and read it back from the DVD disc, while repeating in an endless loop. This is only done when the result of the self-test contains no errors. Errors are stored in NVRAM.
625	DS_BE_SledgeMotorSlow	It moves the sledge full stroke several times slow enough to allow visual inspection of unhampered movement
626	DS_BE_Tilt	It tests the tilt mechanism control loop, or allow its proper functioning to be measured
627	DS_BE_ReadEeprom	It reads one data byte from the EEPROM
629	DS_BE_OptimiseJitter	It performs jitter optimisation
630	DS_BE_RadialATLSCalibration	It allows the radial loop to be calibrated.
631	DS_BE_GetStatisticsInfo	It retrieves the statistical information from the Basic Engine
632	DS_BE_ResetStatisticsInfo	It erases the statistical information
633	DS_BE_ReadErrorlog	It retrieves the error log from the Basic Engine
634	DS_BE_ResetErrorlog	It erases the fatal error log and the cumulative error log

Ref. #	Function name	Description
638	DS_BE_GetSelfTest Result	It retrieves the result of the Self Test of the Basic engine, which is executed during power-on.
639	DS_BE_RadialInit	It allows the radial initialisation
640	DS_BE_GetOPUInfo	It retrieves the OPU number from the EEPROM of the Basic engine.
641	DS_BE_WriteReadPlusR	It writes data to the BE which is stored on a DVD disc and read it back from the DVD disc. This is only done when the result of the self-test contains no errors.
642	DS_BE_WriteReadPlusREndlessLoop	It writes data to the BE which is stored on a DVD disc and read it back from the DVD disc, while repeating in an endless loop. This is only done when the result of the self-test contains no errors. Errors are stored in NVRAM.
643	DS_BE_ReadTOC	Read TOC Information This nucleus reads the TOC information of a disc.
644	DS_BE_GetDiscInfo	Get Disc Information This nucleus reads from the TOC-info the disc type. If the disc is a DVD+RW or a DVD+R disc, also the ADIP-info will be read to get the disc manufacturer id and the media type id of that disc.
645	DS_BE_DiscErase	Disc Erase This nucleus erases a DVD+RW disc. This disc will be recognized as an empty disc by the application.

Menu Mode Interface (only for Digiboard Empress)

Activation
Connect the recorder to the mains. The following text will appear on the screen of the terminal (program):

```
DVD Video Recorer Diagnostic Software version 48
Basic SDRAM Data bus test passed
Basic SDRAM Address bus test passed
Basic SDRAM Device test passed

(M) enu, (C) ommand or (S) 2B-interface?□    [M] : @ M ↵

Main Menu

1.□  Digital Board□□□          ->□□
2.□  Analogue Board□□□         ->
3.□  Front Panel□□□            ->
4.□  Basic Engine□□□           ->
5.□  DVIO□□□□□                 ->
6.□  Progressive Scan Board□   ->
7.□  Loop tests□□□             ->
8.□  Log□□□□□                  ->
9.□  Scripts□□□□               ->

Select>
```

CL 16532095_074.eps
150801

Figure 5-4 Opening screen for Menu Mode

The first line indicates that the Diagnostic software has been activated and contains the version number. The next lines are the successful result of the SDRAM interconnection test and the basic SDRAM test. The last line allows the user to choose between the three possible interface forms.

If pressing 'M' has made a choice for Menu Interface, the Main Menu will appear.

Menu Structure
1. Digital Board
2. Analogue Board
3. Front Panel
4. **Basic Engine**
    1. Reset
    2. S2B Pass-through
    3. S2B Echo
    4. Focus On
    5. Focus Off
    6. Version
    7. Self Test
    8. Get Self Test Result
    9. Basic Engine Test
    10. Laser Test
    11. Focus Test
    12. Tilt Test
    13. Optimise Jitter
    14. Statistics Info
    15. Log
        1. Read Error Log
        2. Reset Error LogSpindle Motor
    16. Spindle Motor
        1. Spindle Motor On
        2. Spindle Motor Off
        3. Spindle Motor Test
    17. Radial
        1. Radial On
        2. Radial Off
        3. Radial Initialisation
        4. Radial ATLS Calibration
    18. Sledge
        1. Sledge test
        2. Sledge test slow
    19. Tray
        1. Tray In
        2. Tray Out
5. DVIO
6. Progressive Scan Board
7. Loop Tests
8. Log
9. Scripts

5.4 Fault Finding

Below you will find faultfinding trees for all the main parts of the Basic Engine.

5.4.1 Basic Engine

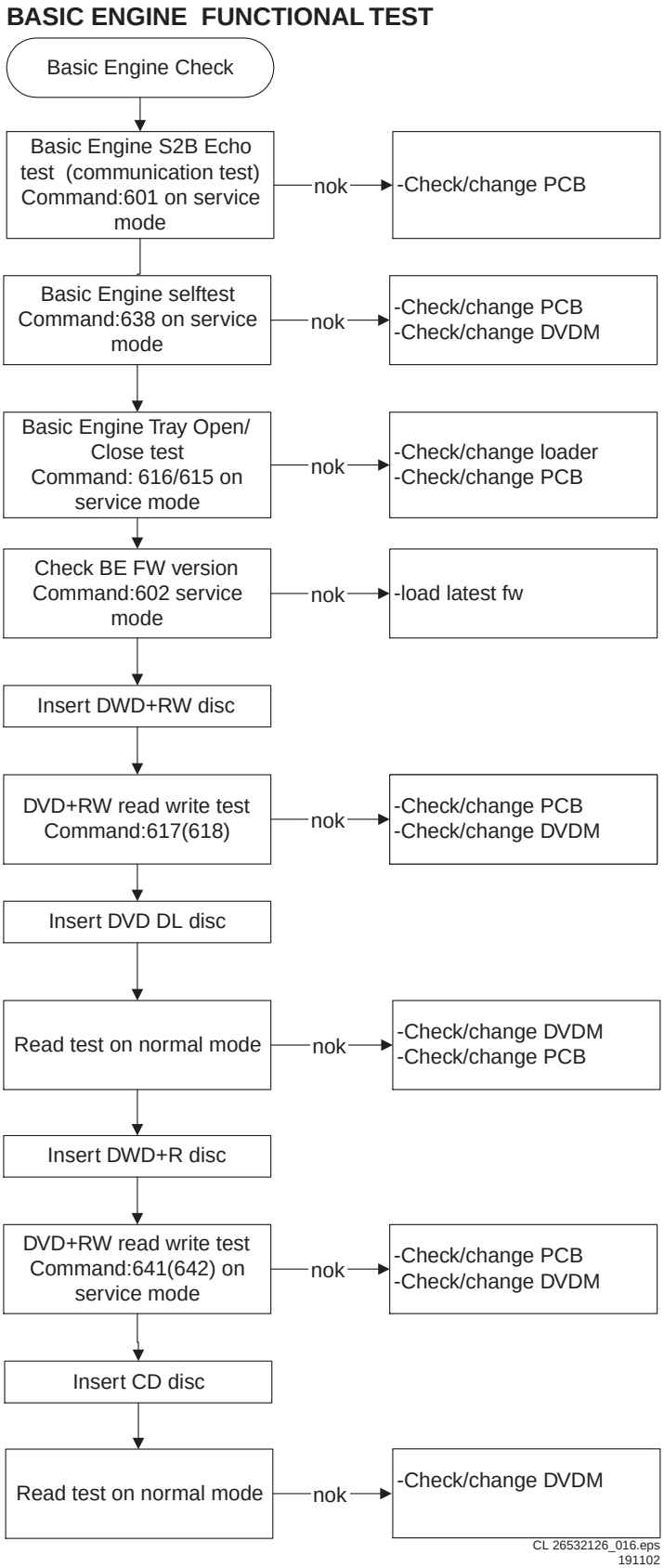


Figure 5-5 Basic Engine functional testing

5.4.2 Loader

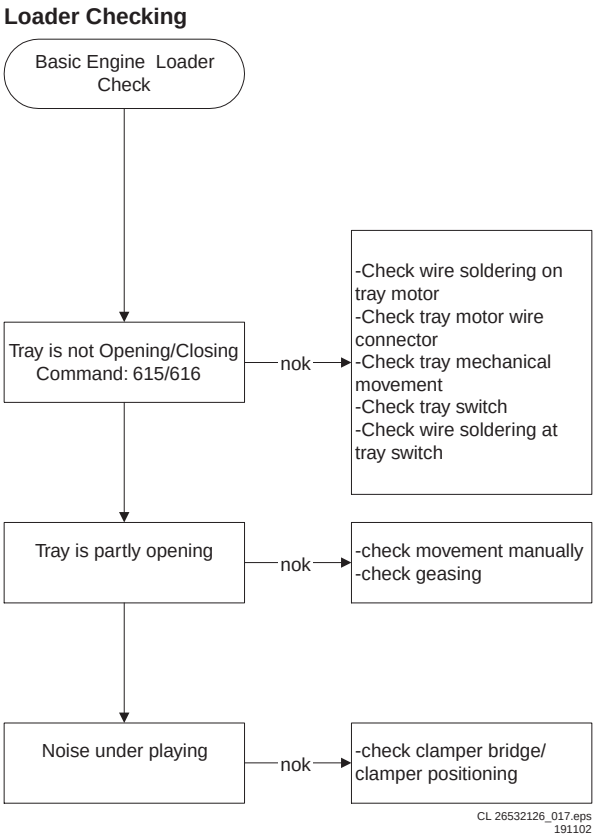


Figure 5-6 Loader testing

5.4.3 DVD-M

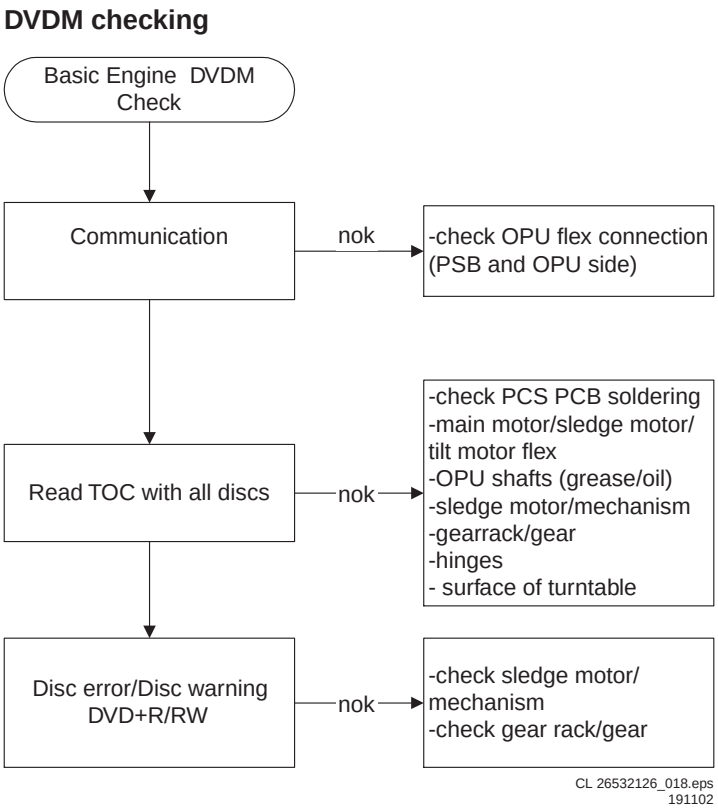


Figure 5-7 DVD-M testing

5.4.4 PWB

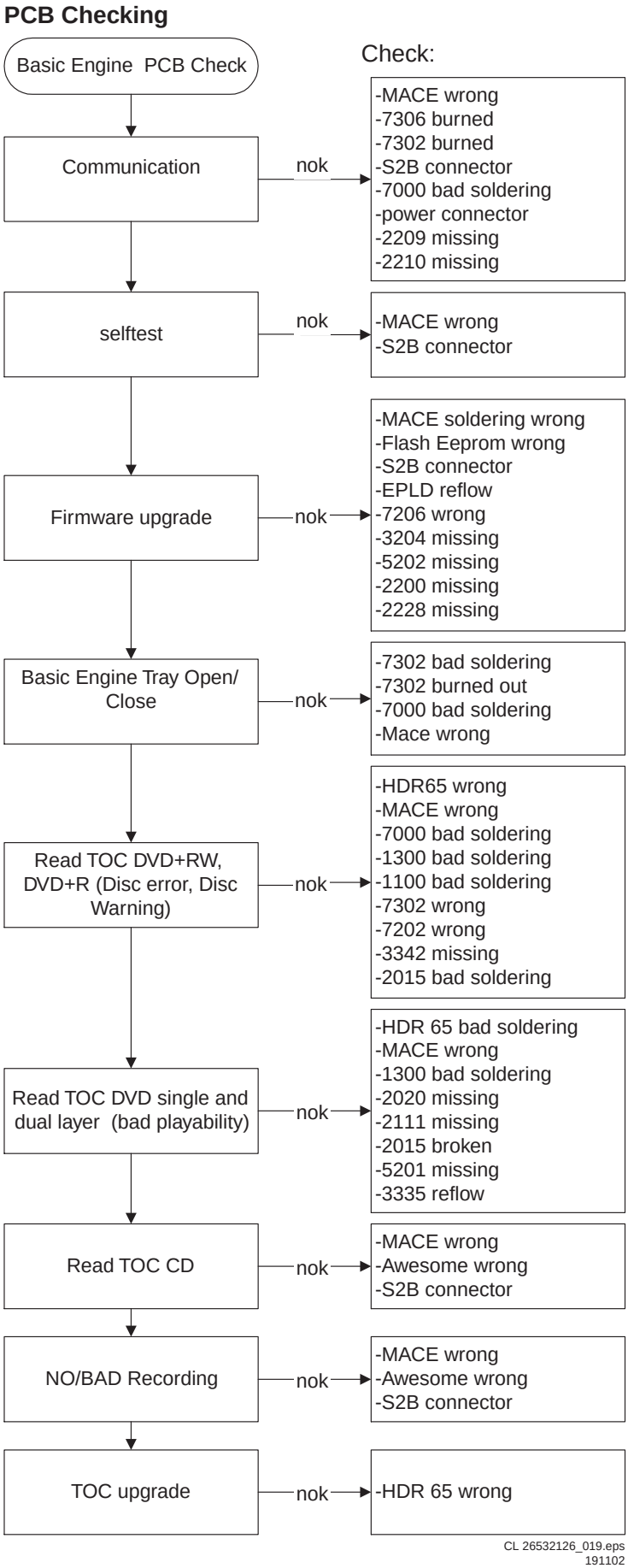
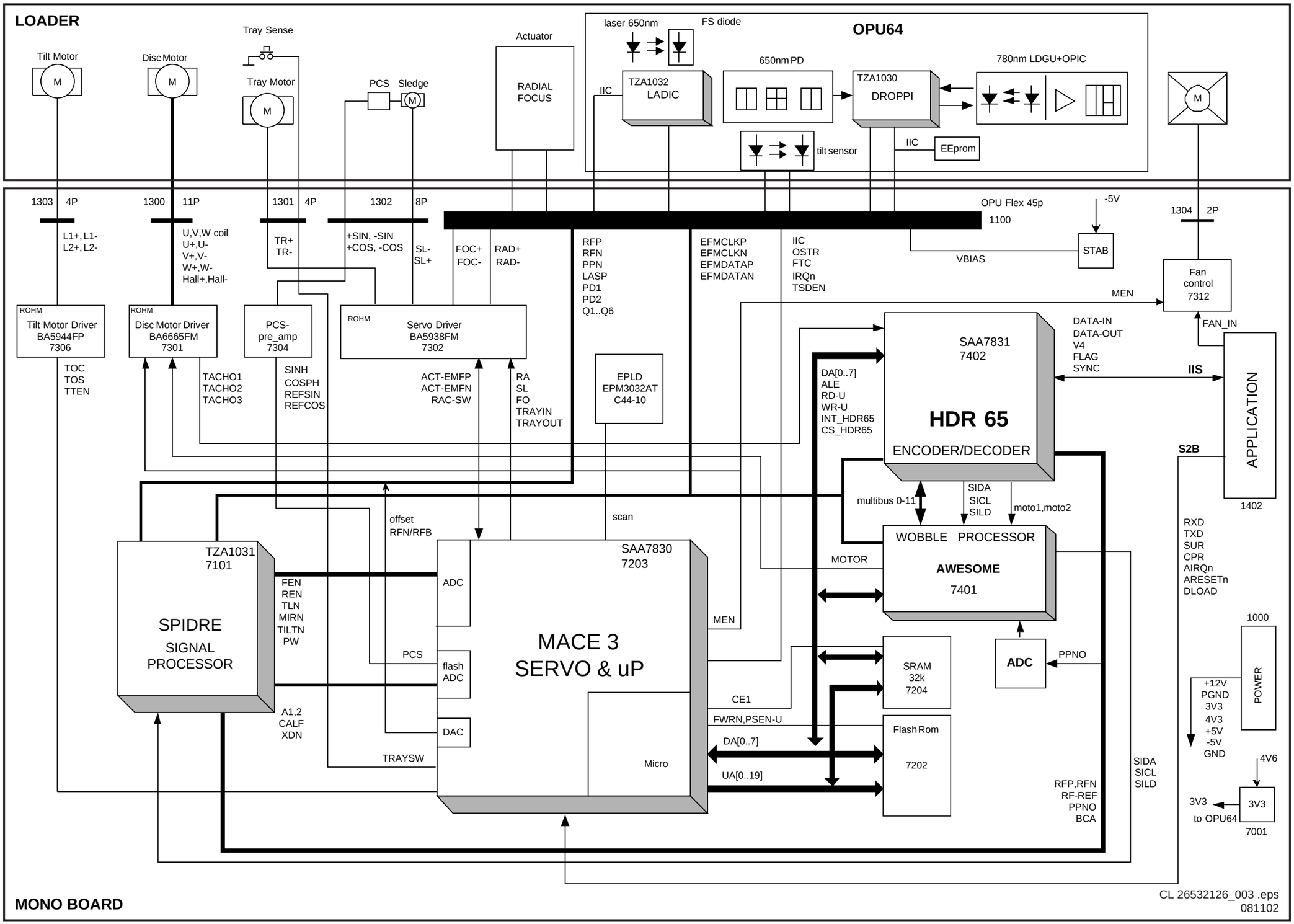


Figure 5-8 Mono board testing

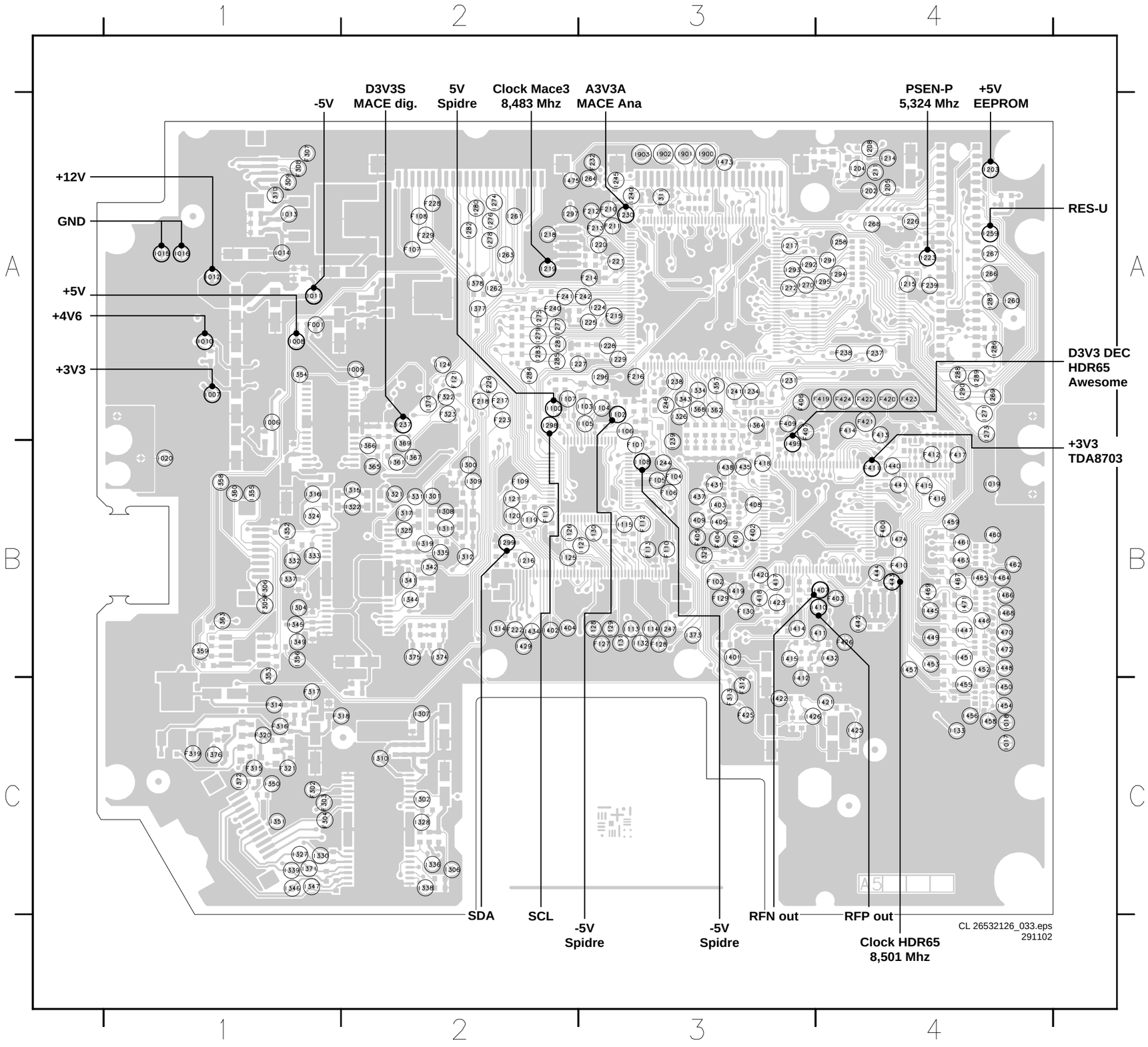
Personal Notes:

6. Block Diagram.

Block Diagram



Test Point Overview Servo Board 43015



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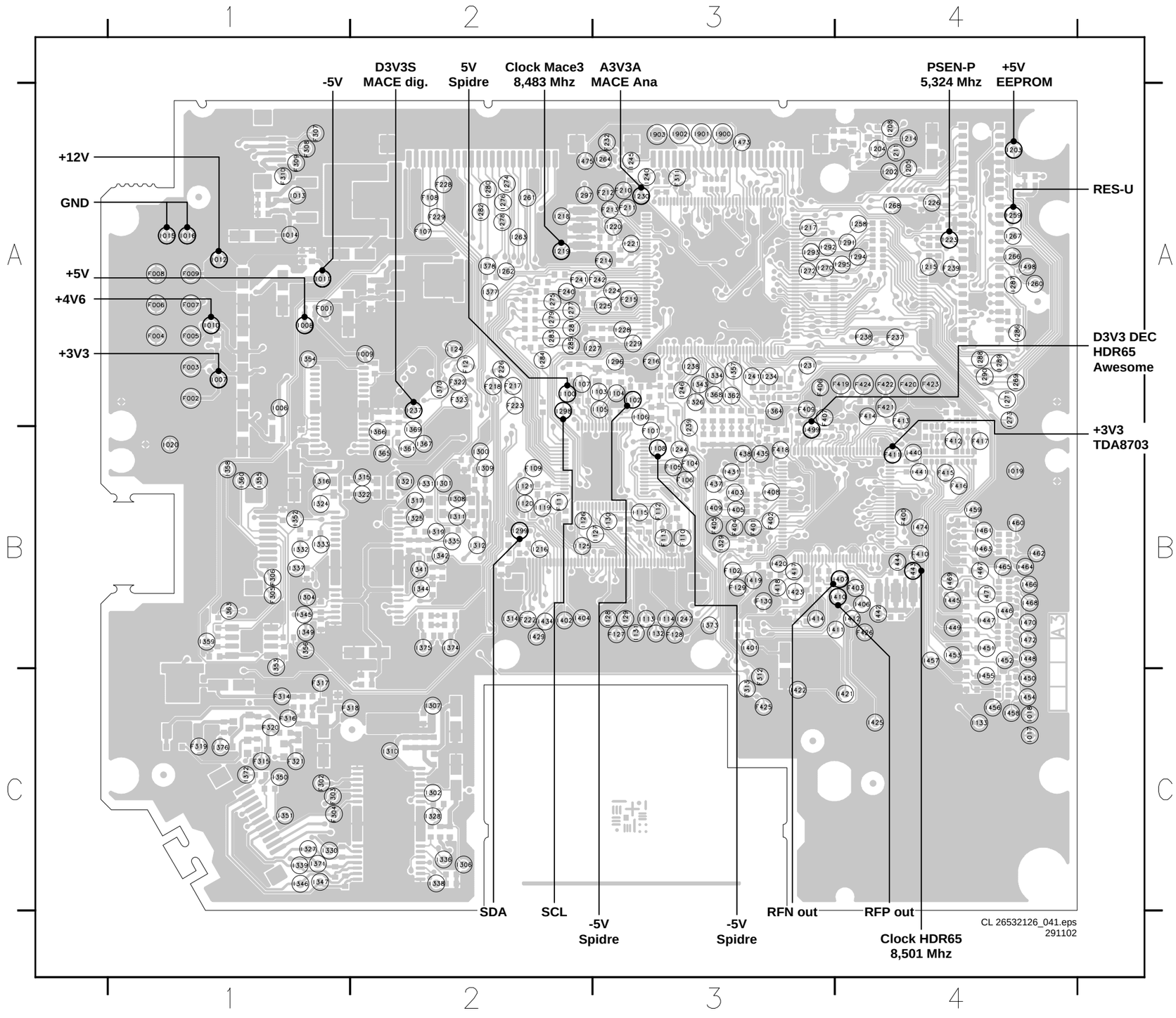
F101	B3	F410	B4	I221	A3	I310	C2	I408	B3
F102	B3	F411	B4	I223	A4	I311	B2	I409	B3
F104	B3	F412	B4	I224	A3	I312	B2	I410	B4
F105	B3	F413	A4	I225	A3	I314	B2	I411	B4
F106	B3	F414	A4	I226	A4	I315	B2	I412	C3
F107	A2	F415	B4	I227	A2	I316	B1	I414	B3
F108	A2	F416	B4	I228	A3	I317	B2	I415	B3
F109	B2	F417	B4	I229	A3	I319	B2	I417	B3
F110	B3	F418	B3	I230	A3	I321	B2	I418	B3
F111	B2	F419	A4	I231	A3	I322	B2	I419	B3
F112	B3	F420	A4	I234	A3	I324	B1	I420	B3
F113	B3	F421	A4	I237	A2	I325	B2	I421	C4
F121	A2	F422	A4	I238	A3	I326	A3	I422	C3
F127	B3	F423	A4	I239	B3	I327	C1	I423	B3
F128	B3	F424	A4	I240	A3	I328	C2	I425	C4
F129	B3	F425	C3	I241	A3	I329	B3	I426	C3
F130	B3	F426	B4	I244	B3	I330	C1	I429	B2
F210	A3	I006	A1	I245	A3	I331	B2	I431	B3
F211	A3	I007	A1	I246	A3	I332	B1	I432	B4
F212	A3	I008	A1	I247	B3	I333	B1	I434	B2
F213	A3	I009	A2	I258	A4	I334	A3	I435	B3
F214	A3	I010	A1	I259	A4	I335	B2	I437	B3
F215	A3	I011	A1	I260	A4	I336	C2	I438	B3
F216	A3	I012	A1	I261	A2	I337	B1	I440	B4
F217	A2	I013	A1	I262	A2	I338	C2	I441	B4
F218	A2	I014	A1	I263	A2	I339	C1	I442	B4
F222	B2	I015	A1	I264	A3	I341	B2	I443	B4
F223	A2	I016	A1	I266	A4	I342	B2	I444	B4
F226	A2	I017	C4	I267	A4	I343	A3	I445	B4
F228	A2	I018	C4	I268	A4	I344	B2	I446	B4
F229	A2	I019	B4	I269	A4	I345	B1	I447	B4
F232	A3	I020	B1	I270	A3	I346	C1	I448	B4
F237	A4	I100	A2	I271	A4	I347	C1	I449	B4
F238	A4	I102	A3	I272	A3	I349	B1	I450	C4
F239	A4	I103	A3	I273	A4	I350	C1	I451	B4
F240	A2	I104	A3	I274	A2	I351	C1	I452	B4
F241	A2	I105	A3	I275	A2	I352	B1	I453	B4
F242	A3	I106	A3	I276	A2	I353	B1	I454	C4
F302	C1	I107	A2	I277	A2	I354	A1	I455	C4
F303	C1	I108	B3	I278	A2	I355	B1	I456	C4
F304	C1	I113	B3	I279	A2	I356	B1	I457	B4
F305	B1	I114	B3	I280	A2	I357	A3	I458	C4
F306	B1	I115	B3	I281	A2	I358	B1	I459	B4
F307	A1	I119	B2	I282	A2	I359	B1	I460	B4
F308	A1	I120	B2	I283	A2	I360	B1	I461	B4
F309	A1	I121	B2	I284	A2	I361	B2	I462	B4
F310	A1	I124	A2	I285	A2	I362	A3	I463	B4
F311	A3	I125	B2	I286	A4	I363	B1	I464	B4
F312	C3	I126	B2	I287	A4	I364	A3	I465	B4
F313	C3	I127	B3	I288	A4	I365	B2	I466	B4
F314	C1	I128	B3	I289	A4	I366	B2	I467	B4
F315	C1	I129	B3	I290	A4	I367	B2	I468	B4
F316	C1	I130	B3	I291	A4	I368	A3	I469	B4
F317	C1	I131	B3	I292	A3	I369	B2	I470	B4
F318	C2	I132	B3	I293	A3	I370	A2	I471	B4
F319	C1	I133	C4	I294	A4	I371	C1	I472	B4
F320	C1	I202	A4	I295	A4	I372	C1	I473	A3
F321	C1	I203	A4	I296	A3	I373	B3	I474	B4
F322	A2	I204	A4	I297	A2	I374	B2	I475	A2
F323	A2	I205	A4	I298	A2	I375	B2	I499	B3
F400	B4	I208	A4	I299	B2	I376	C1	I900	A3
F401	B3	I211	A4	I300	B2	I377	A2	I901	A3
F402	B3	I214	A4	I301	B2	I378	A2	I902	A3
F403	B4	I215	A4	I302	C2	I401	B3	I903	A3
F404	B3	I216	B2	I304	B1	I402	B2		
F405	B3	I217	A3	I306	C2	I403	B3		
F406	A3	I218	A2	I307	C2	I404	B2		
F407	A3	I219	A2	I308	B2	I405	B3		

Test Point Overview Servo Board 43353



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F003	A1	F401	B3	I208	A4	I298	A2	I374	B2	I498	A4
F004	A1	F402	B3	I211	A4	I299	B2	I375	B2	I499	B3
F005	A1	F403	B4	I214	A4	I300	B2	I376	C1	I900	A3
F006	A1	F404	B3	I215	A4	I301	B2	I377	A2	I901	A3
F007	A1	F405	B3	I216	B2	I302	C2	I378	A2	I902	A3
F008	A1	F406	A3	I217	A3	I304	B1	I401	B3	I903	A3
F009	A1	F407	A3	I218	A2	I306	C2	I402	B2		
F101	B3	F409	A3	I219	A2	I307	C2	I403	B3		
F102	B3	F410	B4	I220	A3	I308	B2	I404	B2		
F104	B3	F411	B4	I221	A3	I309	B2	I405	B3		
F105	B3	F412	B4	I223	A4	I310	C2	I406	B4		
F106	B3	F413	A4	I224	A3	I311	B2	I407	B4		
F107	A2	F414	A4	I225	A3	I312	B2	I408	B3		
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F109	B2	F416	B4	I227	A2	I315	B2	I410	B4		
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F111	B2	F418	B3	I229	A3	I317	B2	I412	B4		
F112	B3	F419	A4	I230	A3	I319	B2	I414	B3		
F113	B3	F420	A4	I231	A3	I321	B2	I417	B3		
F121	A2	F421	A4	I234	A3	I322	B2	I418	B3		
F127	B3	F422	A4	I237	A2	I324	B1	I419	B3		
F128	B3	F423	A4	I238	A3	I325	B2	I420	B3		
F129	B3	F424	A4	I239	B3	I326	A3	I421	C4		
F130	B3	F425	C3	I240	A3	I327	C1	I422	C3		
F210	A3	F426	B4	I241	A3	I328	C2	I423	B3		
F211	A3	I006	A1	I244	B3	I329	B3	I425	C4		
F212	A3	I007	A1	I245	A3	I330	C1	I429	B2		
F213	A3	I008	A1	I246	A3	I331	B2	I431	B3		
F214	A3	I009	A2	I247	B3	I332	B1	I434	B2		
F215	A3	I010	A1	I258	A4	I333	B1	I435	B3		
F216	A3	I011	A1	I259	A4	I334	A3	I437	B3		
F217	A2	I012	A1	I260	A4	I335	B2	I438	B3		
F218	A2	I013	A1	I261	A2	I336	C2	I440	B4		
F222	B2	I014	A1	I262	A2	I337	B1	I441	B4		
F223	A2	I015	A1	I263	A2	I338	C2	I442	B4		
F226	A2	I016	A1	I264	A3	I339	C1	I443	B4		
F228	A2	I017	C4	I266	A4	I341	B2	I444	B4		
F229	A2	I018	C4	I267	A4	I342	B2	I445	B4		
F232	A3	I019	B4	I268	A4	I343	A3	I446	B4		
F237	A4	I020	B1	I269	A4	I344	B2	I447	B4		
F238	A4	I100	A2	I270	A3	I345	B1	I448	B4		
F239	A4	I102	A3	I271	A4	I346	C1	I449	B4		
F240	A2	I103	A3	I272	A3	I347	C1	I450	C4		
F241	A2	I104	A3	I273	A4	I349	B1	I451	B4		
F242	A3	I105	A3	I274	A2	I350	C1	I452	B4		
F302	C1	I106	A3	I275	A2	I351	C1	I453	B4		
F303	C1	I107	A2	I276	A2	I352	B1	I454	C4		
F304	C1	I108	B3	I277	A2	I353	B1	I455	C4		
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F308	A1	I119	B2	I281	A2	I357	A3	I459	B4		
F309	A1	I120	B2	I282	A2	I358	B1	I460	B4		
F310	A1	I121	B2	I283	A2	I359	B1	I461	B4		
F311	A3	I124	A2	I284	A2	I360	B1	I462	B4		
F312	C3	I125	B2	I285	A2	I361	B2	I463	B4		
F313	C3	I126	B2	I286	A4	I362	A3	I464	B4		
F314	C1	I127	B3	I287	A4	I363	B1	I465	B4		
F315	C1	I128	B3	I288	A4	I364	A3	I466	B4		
F316	C1	I129	B3	I289	A4	I365	B2	I467	B4		
F317	C1	I130	B3	I290	A4	I366	B2	I468	B4		
F318	C2	I131	B3	I291	A4	I367	B2	I469	B4		
F319	C1	I132	B3	I292	A3	I368	A3	I470	B4		
F320	C1	I133	C4	I293	A3	I369	B2	I471	B4		
F321	C1	I202	A4	I294	A4	I370	A2	I472	B4		
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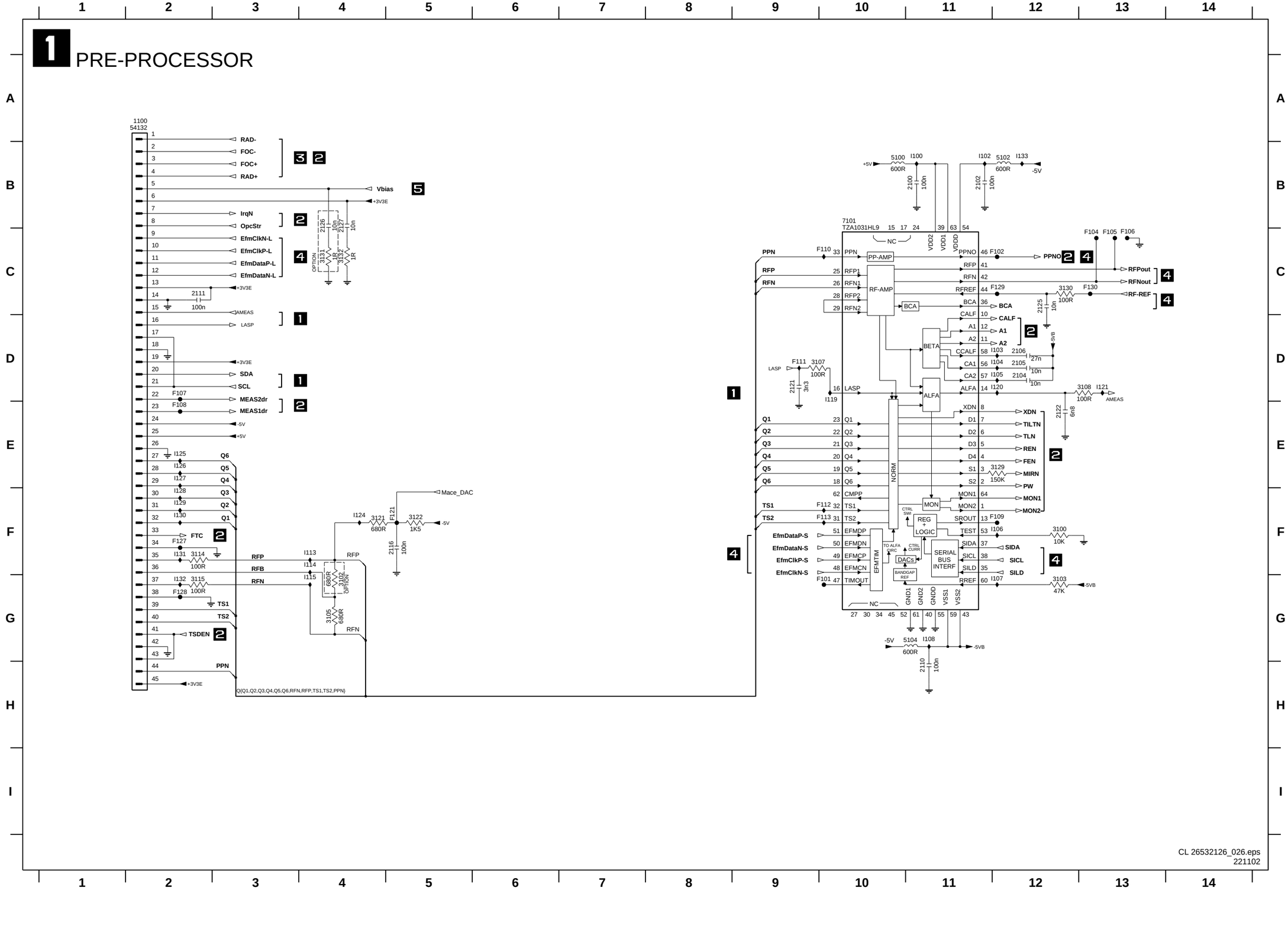
7. Electrical Diagrams and Print-Layouts

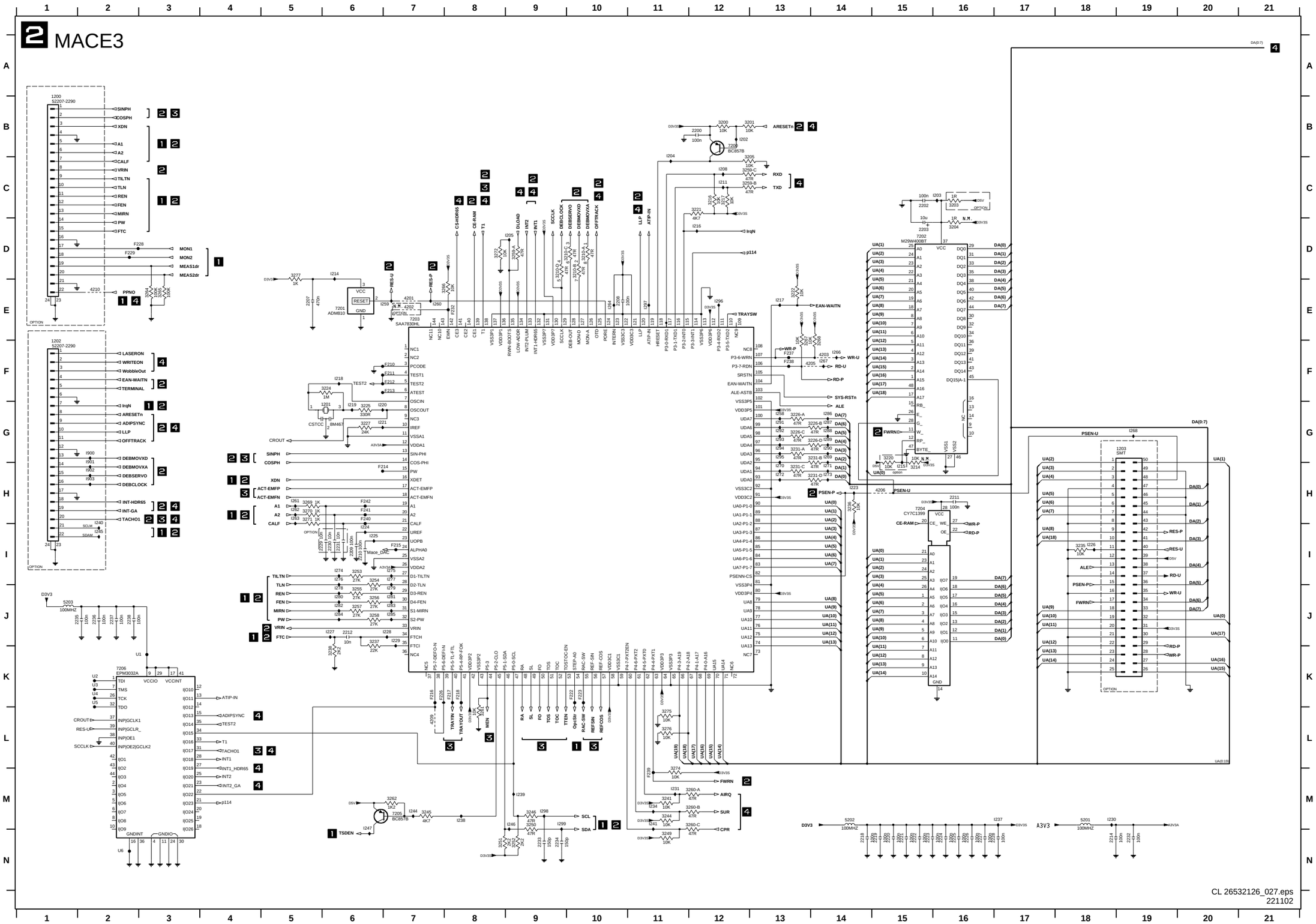
Servo Board 123 43015: Pre- Processor



1100 A2
2100 B11
2102 B11
2104 D12
2105 D12
2106 D12
2110 H11
2111 C2
2116 F5
2121 D9
2122 E12
2125 C12
2126 B4
2127 B4
3100 F12
3102 G4
3103 G12
3105 G4
3107 D9
3108 D13
3114 F2
3115 G2
3121 F4
3122 F5
3129 E12
3130 C12
3131 C4
3132 C4
5100 B10
5102 B12
5104 G11
7101 B10
F101 G10
F102 C12
F104 C13
F105 C13
F106 C13
F107 D2
F108 E2
F109 F12
F121 F5
F127 F2
F128 G2
F129 C12
F130 C13

Servo Board 123 43015: MACE3

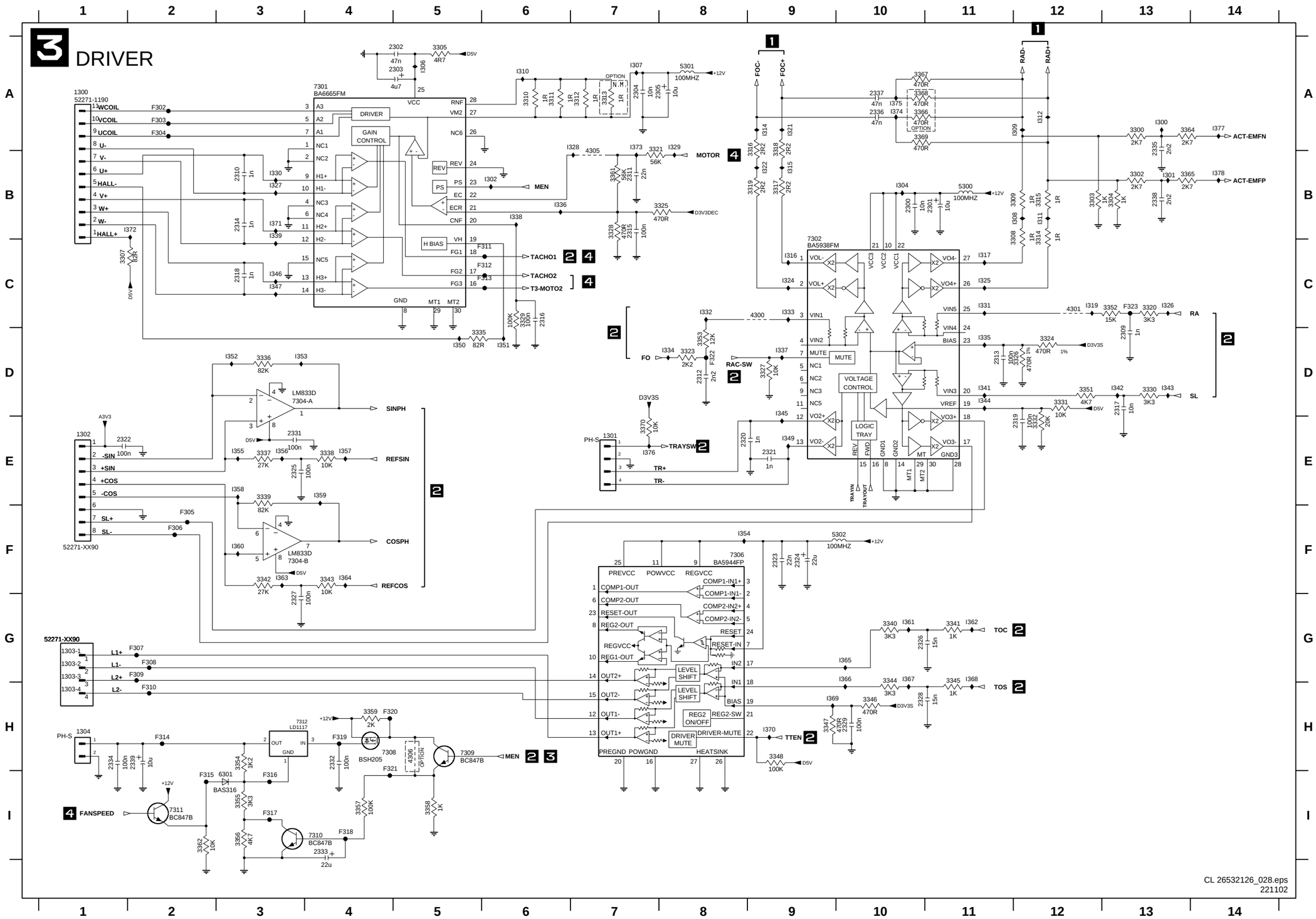
2 MACE3



U1 K2
U2 K2
U3 K2
U4 K2
U5 K2
U6 N2
1200 B1
1201 G6
1202 F1
1203 G19
2200 B12
2202 C15
2203 D15
2207 E5
2208 E10
2209 I6
2210 I6
2211 H16
2212 J6
2214 N18
2218 N14
2219 N15
2220 N15
2221 N15
2222 N15
2223 N15
2224 N16
2225 N16
2226 N16
2227 N16
2228 N17
2229 I5
2230 I6
2231 I6
2232 N19
2233 N9
2234 N9
2235 J2
2236 J2
2237 J2
2238 J2
3200 B12
3201 B12
3203 C16
3204 D16
3205 C12
3210-A D10
3210-B D10
3210-C D10
3210-D D9
3214 H15
3216 C12
3217 C12
3220 G15
3221 C12
3222 E13
3224 F6
3225 G6
3226-A G13
3226-B G14
3226-C G13
3226-D G14
3227 G6
3231-A G13
3231-B G14
3231-C H13
3231-D H14
3235 I18
3236 H14
3237 J6
3238 K6
3241 M11
3244 M11
3245 M7
3246 M9
3249 N11
3250 M9
3251 N8
3252 N9
3253 I6
3254 I6
3255 J6
3256 J6
3257 J6
3258 J6
3259-A D9
3259-B C12
3259-C C12
3260-A M12
3260-B M12
3260-C M12
3261 L8
3262 M7
3264 E3
3265 E3
3266 E8
3267 F13
3268 F14
3269 H5
3270 H5
3271 H5
3272 D8
3274 M11
3275 L11
3276 L11
3277 D5
4201 E7
4202 E7
4203 F14
4205 F13
4206 H15
4209 L7
4210 E2
5201 M18
5202 M14
5203 J1
7200 B12
7201 E6
7202 D15
7203 E7
7204 H15
7205 M7
7206 K2
F210 F7
F211 F7
F212 F7
F213 F7
F214 H6
F215 I7
F216 K7
F217 K8
F218 K8
F222 K10
F223 K10
F228 D2
F229 D2
F232 E8
F237 F13
F238 F13
F239 M11
F240 H6
F241 H6
F242 H6

Servo Board 123 43015: Driver

3 DRIVER



CL 26532126_028.eps
221102

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1301 E7	7306 F8
1302 E1	7308 H4
1303-1 G1	7309 H5
1303-2 G1	7310 I4
1303-3 G1	7311 I2
1303-4 H1	7312 H3
1304 H1	F302 A2
2300 B10	F303 A2
2301 B11	F304 A2
2302 A5	F305 F2
2303 A5	F306 F2
2304 A7	F307 G2
2305 A8	F308 G2
2309 D13	F309 G2
2310 B3	F310 H2
2311 B7	F311 C6
2312 D8	F312 C6
2313 D11	F313 C6
2314 B3	F314 H2
2315 B7	F315 I2
2316 C6	F316 I3
2317 D13	F317 I3
2318 C3	F318 I4
2319 E12	F319 H4
2320 E8	F320 H4
2321 E9	F321 H4
2322 E1	F322 D8
2323 F9	F323 C13
2324 F9	
2325 E3	
2326 G10	
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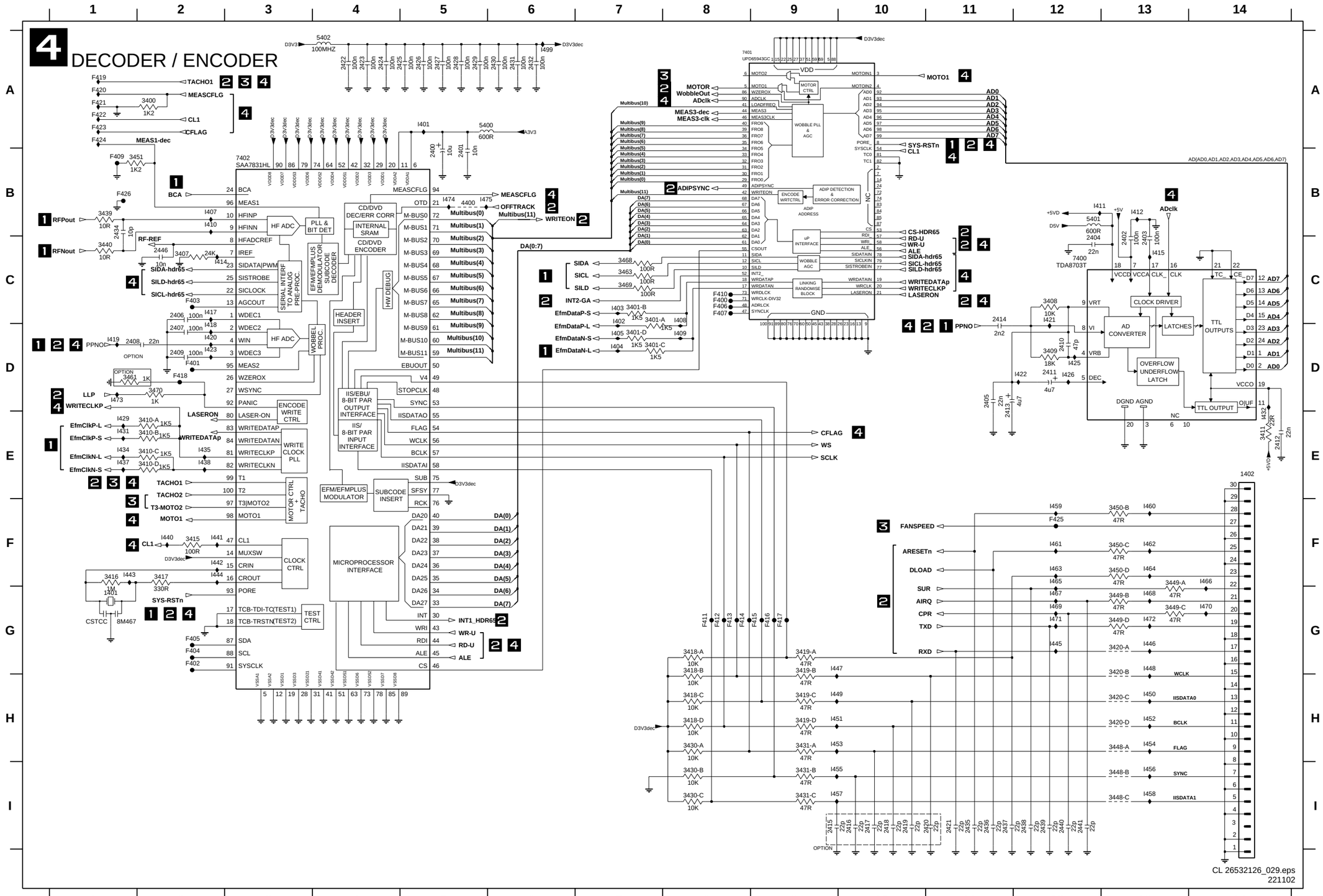
2329 H10	
2331 E3	
2332 H4	
2333 I4	
2334 H1	
2335 A13	
2336 A10	
2337 A10	
2338 B13	
2339 H2	
3300 A13	
3302 B13	
3303 B12	
3304 B13	
3305 A5	
3307 C1	
3308 B12	
3309 B12	
3310 A6	
3311 A6	
3312 A7	
3313 A7	
3314 B12	
3315 B12	
3316 A9	
3317 B9	
3318 A9	
3319 B9	
3320 C13	
3321 B7	
3323 D8	
3324 D12	
3325 B8	
3326 D12	
3327 D9	
3328 B7	
3329 C6	
3330 D13	
3331 D12	
3332 E12	
3335 D5	
3336 D3	
3337 E3	
3338 E4	
3339 E3	
3340 G10	
3341 G11	
3342 F3	
3343 F4	
3344 H10	
3345 H11	
3346 H10	
3347 H9	
3348 H9	
3351 D12	
3352 C13	
3353 D8	
3354 H3	
3355 I3	
3356 I3	
3357 I4	
3358 I5	
3359 H4	
3361 B7	
3362 I2	
3364 A13	
3365 B13	
3366 A10	
3367 A10	
3368 A10	
3369 A10	
3370 E7	
4300 C9	
4301 C12	
4305 B7	
4306 H5	
5300 B11	
5301 A8	
5302 F10	
6301 I3	
7301 A4	
7302 C9	
7304-A D3	

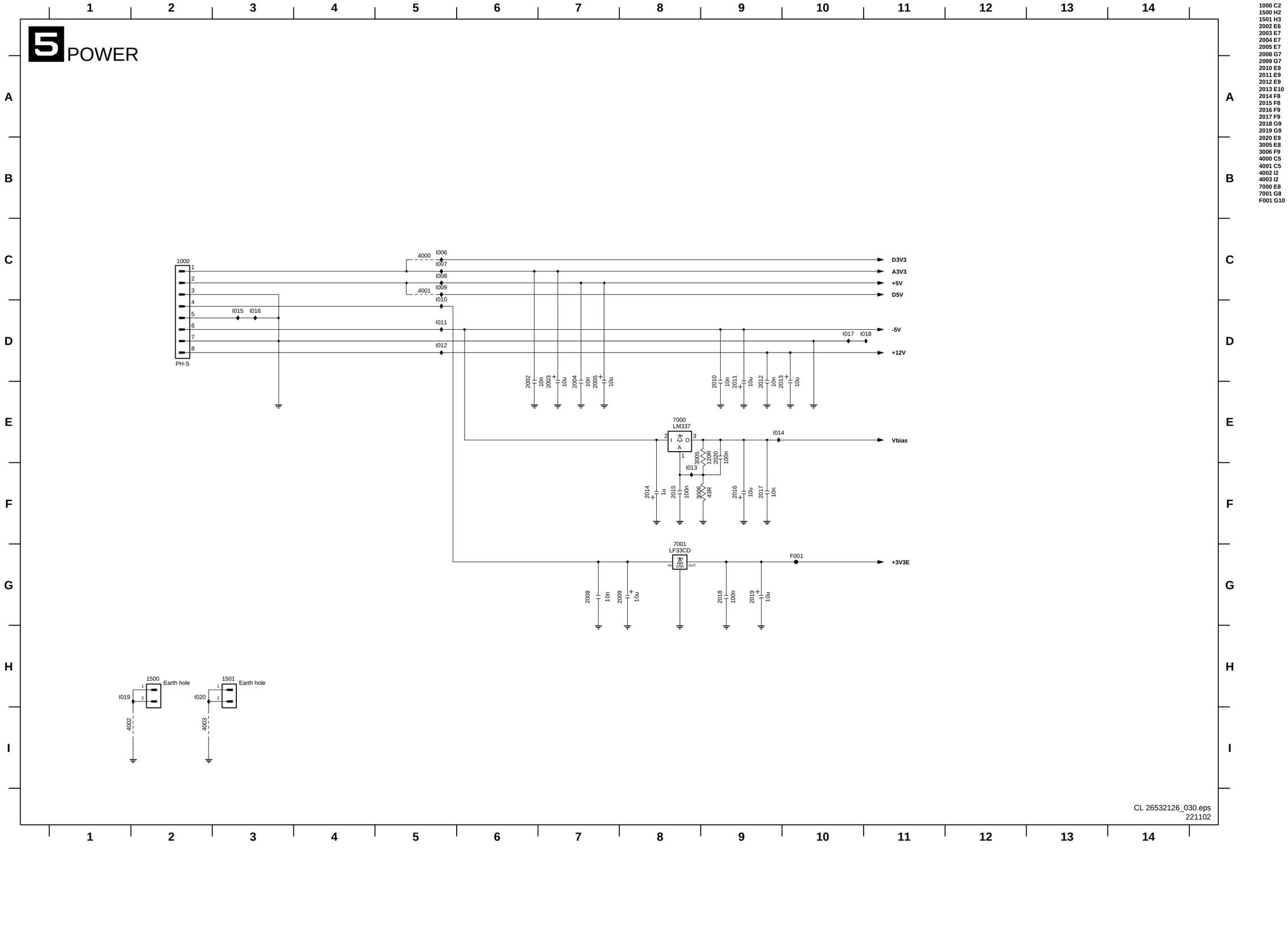
Servo Board 123 43015: Decoder / Encoder

4 DECODER / ENCODER

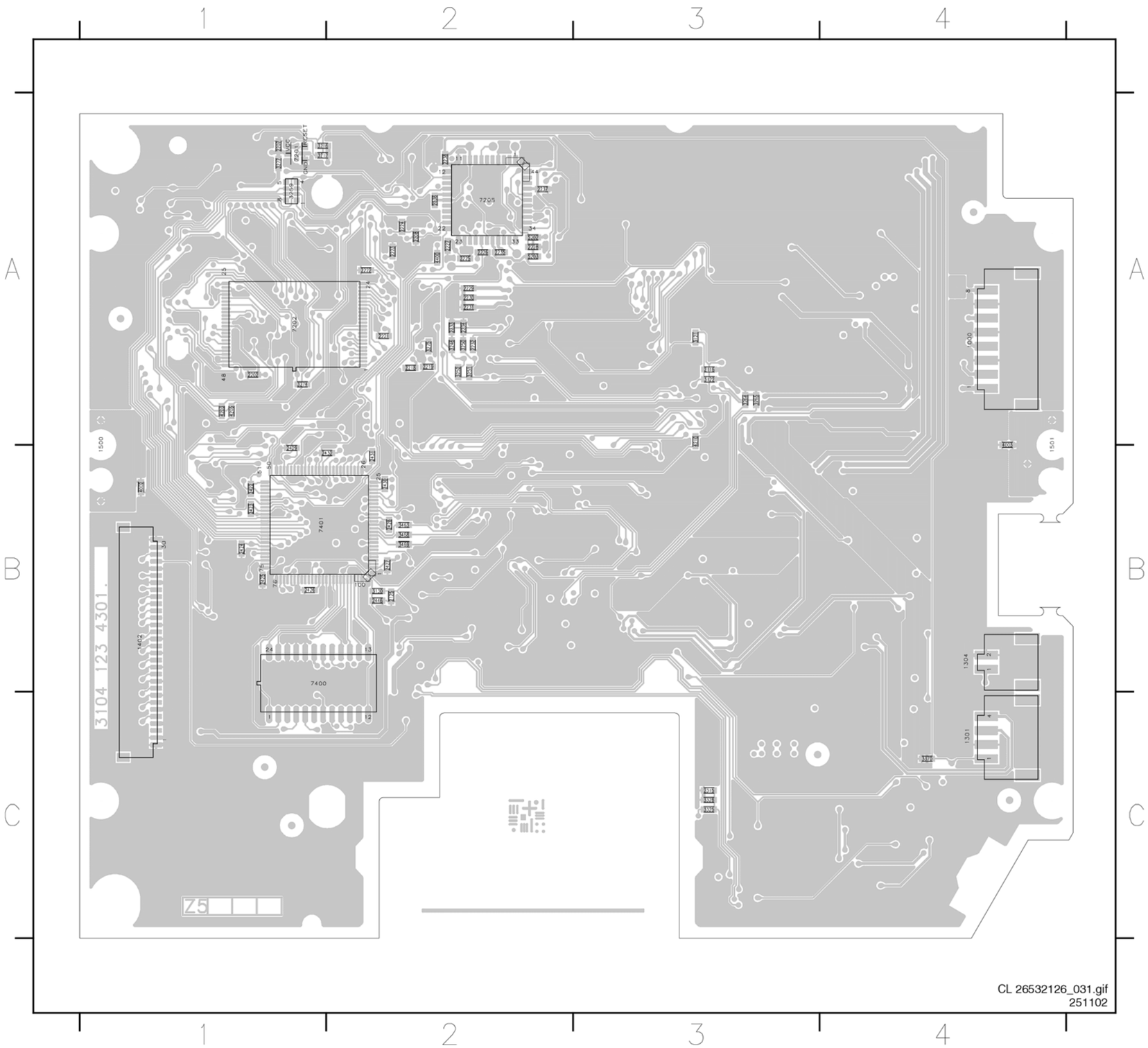


1401 G1 F416 G9
1402 E14 F417 G9
2400 B5 F418 D2
2401 B5 F425 F12
2402 C13 F426 B1
2403 C13
2404 C12
2405 D11
2406 C2
2407 D2
2408 D1
2409 D2
2410 D12
2411 D12
2412 E14
2413 D11
2414 C11
2415 I9
2416 I10
2417 I10
2418 I10
2419 I10
2420 I11
2421 I11
2422 A4
2423 A4
2424 A4
2425 A5
2426 A5
2427 A5
2428 A5
2429 A5
2430 A6
2431 A6
2432 A6
2434 B1
2435 I11
2436 I11
2437 I11
2438 I12
2439 I12
2440 I12
2441 I12
2446 C2
3400 A2
3401-A C7
3401-B C7
3401-C D7
3401-D D7
3407 C2
3408 C12
3409 D12
3410-A E2
3410-B E2
3410-C E2
3410-D E2
3411 E14
3415 F2
3416 F1
3417 F2
3418-A G8
3418-B G8
3418-C H8
3418-D H8
3419-A G9
3419-B G9
3419-C H9
3419-D H9
3420-A G13
3420-B H13
3420-C H13
3420-D H13
3430-A H8
3430-B I8
3430-C I8
3431-A H9
3431-B I9
3431-C I9
3439 B1
3440 C1
3448-A H13
3448-B I13
3448-C I13
3449-A F13
3449-B G13
3449-C G13
3449-D G13
3450-B F13
3450-C F13
3450-D F13
3451 B1
3461 D1
3463 C7
3468 C7
3469 C7
3470 D2
4400 B5
5400 A5
5401 B12
5402 A4
7400 C12
7401 A8
7402 B3
F400 C8
F401 D2
F402 G2
F403 C2
F404 G2
F405 G2
F406 C8
F407 C8
F409 B1
F410 C8
F411 G8
F412 G8
F413 G8
F414 G8
F415 G9

Servo Board 123 43015: Power

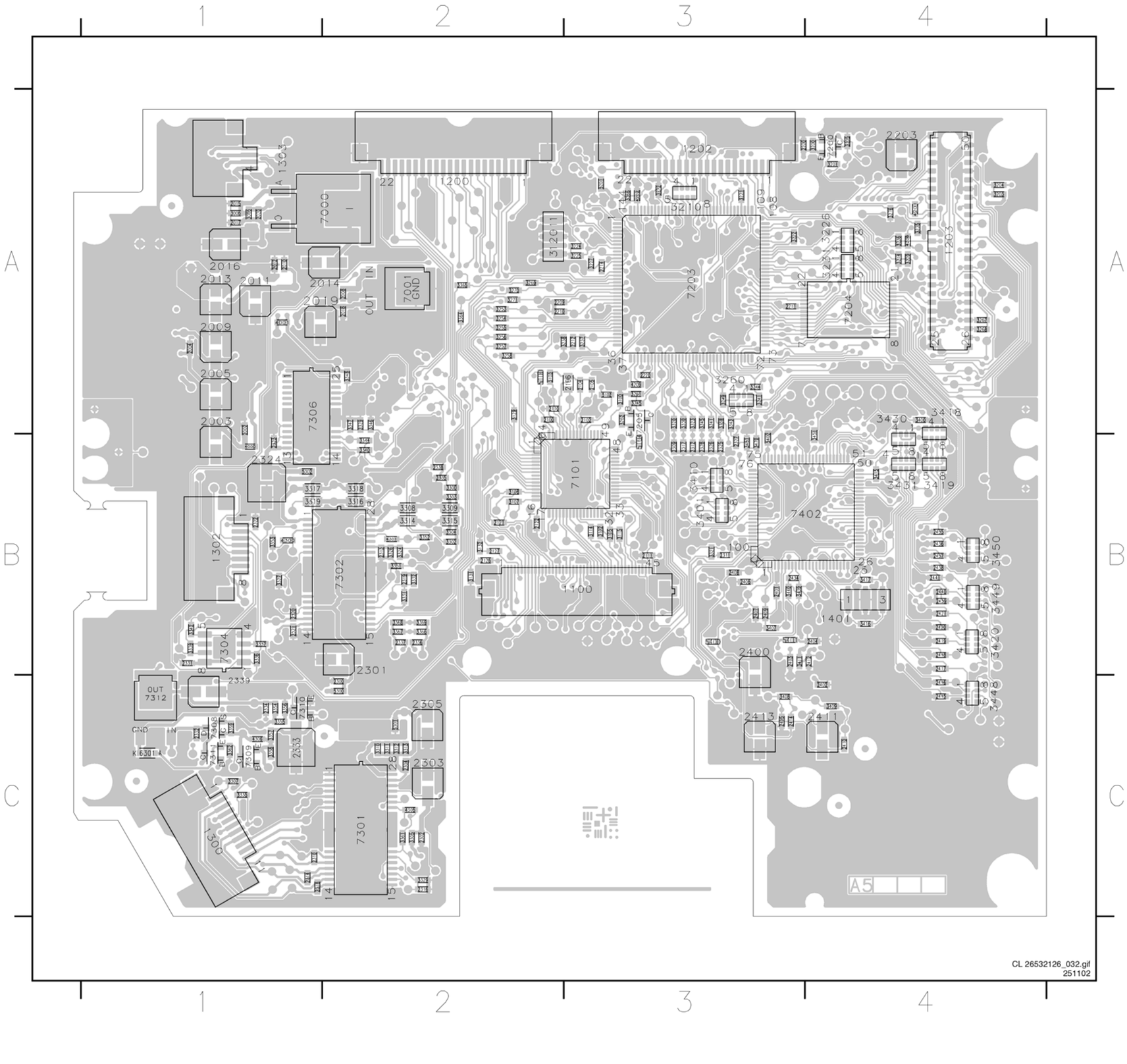


Layout Servo Board (Top Side) 123 43015



1000	A4	4400	A2
1301	C4	5202	A2
1304	B4	5203	A2
1402	B1	7201	A1
2116	A3	7202	A1
2125	B2	7206	A2
2202	A1	7400	B1
2207	A1	7401	B1
2208	A2		
2218	A2		
2219	A2		
2221	A2		
2222	A2		
2223	A2		
2224	A2		
2225	A2		
2226	A2		
2227	A2		
2228	A2		
2229	A2		
2230	A2		
2231	A2		
2232	A2		
2233	A2		
2234	A2		
2235	A2		
2236	A2		
2237	A2		
2238	A2		
2315	C3		
2422	B1		
2423	B1		
2424	B1		
2425	B1		
2426	B1		
2427	B2		
2428	B2		
2429	B1		
2430	B2		
2431	B2		
2432	B2		
2446	B2		
3121	A3		
3122	A3		
3130	B2		
3216	A1		
3217	A1		
3246	A2		
3250	A2		
3251	A2		
3252	A2		
3259	A1		
3264	A3		
3265	A3		
3274	A1		
3275	A2		
3277	A1		
3325	C3		
3328	C3		
3370	C4		
3463	B2		
3468	B2		
3469	B2		
4002	B1		
4003	A4		
4203	A1		
4205	A1		
4210	A3		

Layout Servo Board (Bottom Side) 123 43015



1100	B3	2327	B3	3227	A3	3348	A2	7205	A3
1200	A2	2328	B3	3231	A4	3351	B2	7301	C2
1201	A2	2329	A2	3235	A4	3352	B2	7302	B2
1202	A3	2331	B1	3236	A4	3353	B1	7304	B1
1203	A4	2332	C1	3237	A3	3354	C1	7306	A1
1300	C1	2333	C1	3238	A2	3355	C1	7308	C1
1302	B1	2334	C1	3241	A3	3356	C1	7309	C1
1303	A1	2335	B2	3244	A3	3357	C1	7310	C1
1401	B4	2336	B2	3245	A3	3358	C1	7311	C1
2002	A1	2337	B2	3249	A3	3359	C1	7312	C1
2003	B1	2338	B2	3253	A2	3361	C2	7402	B4
2004	A1	2339	C1	3254	A2	3362	C1		
2005	A1	2400	B3	3255	A2	3364	A2		
2008	A2	2401	B3	3256	A2	3365	A2		
2009	A1	2402	C4	3257	A2	3366	B2		
2010	A1	2403	B3	3258	A2	3367	B2		
2011	A1	2404	B4	3260	A3	3368	B2		
2012	A1	2405	C3	3261	A3	3369	B2		
2013	A1	2406	B3	3262	A3	3400	A4		
2014	A2	2407	B3	3266	A3	3401	B3		
2015	A1	2408	B3	3267	A4	3407	B3		
2016	A1	2409	B3	3268	A4	3408	C3		
2017	A1	2410	C4	3269	A2	3409	C4		
2018	A2	2411	C3	3270	A2	3410	B3		
2019	A1	2412	B4	3271	A2	3411	B3		
2020	A1	2413	C3	3272	A3	3415	B4		
2100	A2	2414	C3	3276	A4	3416	B4		
2102	A3	2415	C4	3300	B2	3417	B4		
2104	A3	2416	C4	3302	B2	3418	A4		
2105	A3	2417	B4	3303	B2	3419	B4		
2106	A3	2418	B4	3304	B2	3420	B4		
2110	A2	2419	B4	3305	C2	3430	B4		
2111	B3	2420	B4	3307	C1	3431	B4		
2121	B2	2421	B4	3308	B2	3439	B3		
2122	B2	2434	B3	3309	B2	3440	B3		
2126	B2	2435	B4	3310	C2	3448	C4		
2127	B2	2436	B4	3311	C2	3449	B4		
2200	A3	2437	B4	3312	C2	3450	B4		
2203	A4	2438	B4	3313	C2	3451	B4		
2209	A2	2439	B4	3314	B2	3461	B3		
2210	A2	2440	B4	3315	B2	3470	B3		
2211	A3	2441	B4	3316	B2	4000	B1		
2212	A3	3005	A1	3317	B1	4001	A1		
2214	A3	3006	A1	3318	B2	4201	A4		
2220	A3	3100	A3	3319	B1	4202	A3		
2300	C2	3102	B3	3320	A3	4206	A4		
2301	B1	3103	A2	3321	B3	4209	A3		
2302	C2	3105	B3	3323	A3	4300	B1		
2303	C2	3107	B2	3324	B2	4301	B2		
2304	C2	3108	B2	3326	B2	4305	C2		
2305	C2	3114	B3	3327	B1	4306	C1		
2309	B3	3115	B3	3329	C2	5100	A2		
2310	C1	3129	A2	3330	A3	5102	A3		
2311	B3	3131	B2	3331	B2	5104	B3		
2312	B3	3132	B2	3332	B2	5201	A3		
2313	B2	3200	A4	3335	C1	5300	C2		
2314	C1	3201	A4	3336	B1	5301	C2		
2316	C2	3203	A4	3337	B1	5302	B1		
2317	B3	3204	A4	3338	A3	5400	B3		
2318	C1	3205	A4	3339	B1	5401	B3		
2319	B2	3210	A3	3340	B2	5402	B3		
2320	B1	3214	A4	3341	A3	6301	C1		
2321	B1	3220	A4	3342	B1	7000	A2		
2322	B1	3221	A3	3343	A3	7001	A2		
2323	B1	3222	A3	3344	B2	7101	B3		
2324	B1	3224	A3	3345	A3	7200	A4		
2325	B3	3225	A3	3346	A2	7203	A3		
2326	B3	3226	A4	3347	A2	7204	A4		

Servo Board 123 43353: Pre- Processor

1 PRE-PROCESSOR

1100 54132
RAD-
FOC-
FOC+
RAD+
Vbias
IrqN
OpcStr
EfmClkN-L
EfmClkP-L
EfmDataP-L
EfmDataN-L
+3V3E
2111 100n
AMEAS
LASP
+3V3E
SDA
SCL
F107
MEAS2dr
F108
MEAS1dr
-5V
+5V
I125
Q6
I126
Q5
I127
Q4
I128
Q3
I129
Q2
I130
Q1
FTC
F127
I131 3114 100R
RFP
I113
I132 3115 100R
F128
RFB
I114
RFN
I115
TS1
TS2
TSDEN
PPN
+3V3E
OPTION 3131 1R 2126 10n
3132 1R 2127 10n
680R 3102 OPTION
3105 680R
I124 3121 680R F121 3122 1K5 -5V
2116 100n
Mace_DAC
Q(Q1,Q2,Q3,Q4,Q5,Q6,RFN,RFP,TS1,TS2,PPN)

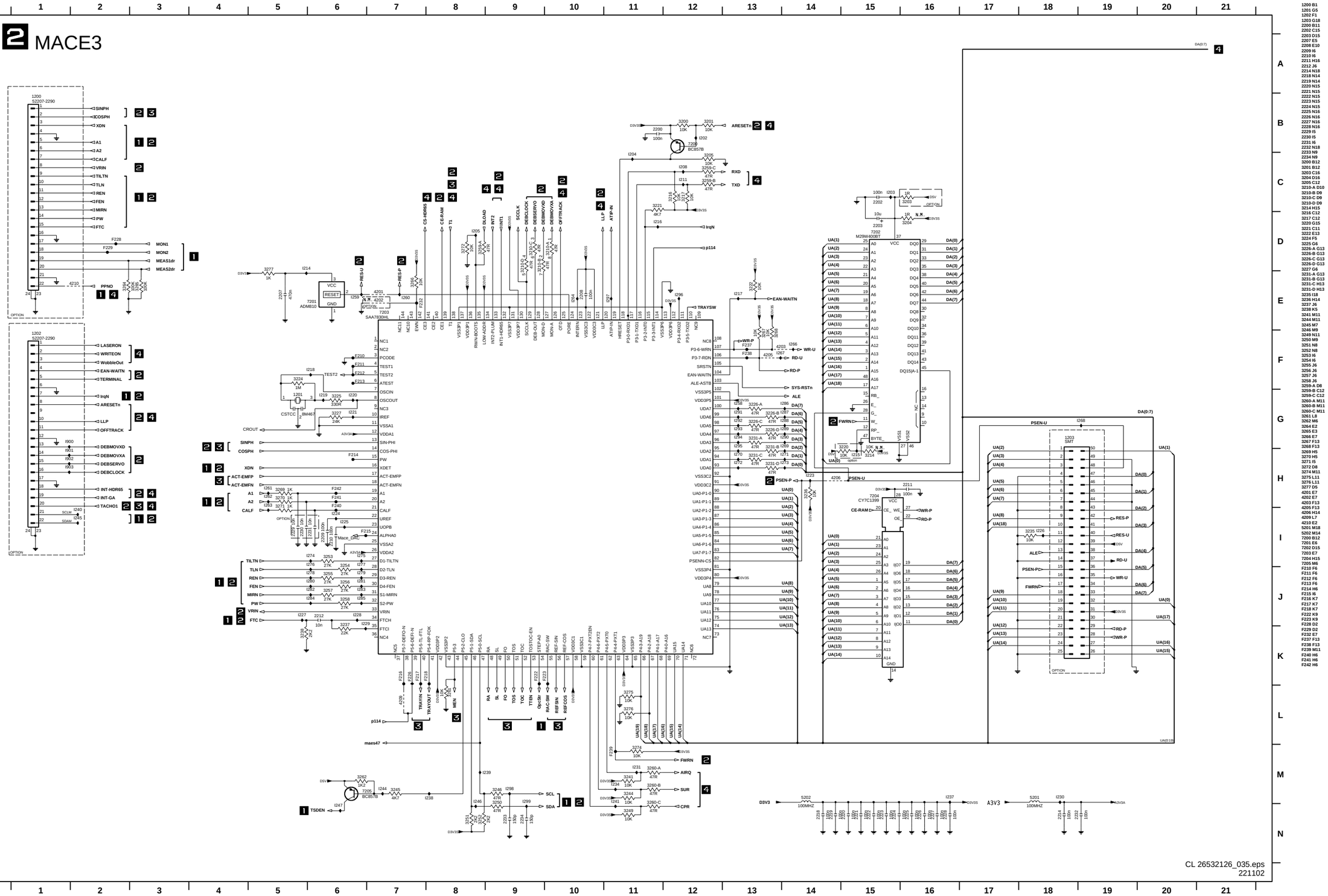
5100 I100 600R +5V
2100 100n
I102 5102 I133 600R -5V
2102 100n
7101 TZA1031HL9
NC 15 17 24
VDD2 39
VDD1 63
VDDD 54
PPN F110 3101 10K 2101 10n
RFP
RFN
PP-AMP
RF-AMP
BCA
PPNO F102
RFP
RFN
RFREF F129
BCA
CALF
A1
A2
CCALF
CA1
CA2
ALFA
F104 F105 F106
RFPout
RFNout
RF-REF
3130 100R F130
2125 10n
3108 I121 100R AMEAS
2122 6n8
BETA
F111 3107 100R LASP
2121 3n3
I119
I103 2106 27n
I104 2105 10n
I105 2104 10n
I120
XDN
D1
D2
D3
D4
S1 3129 150K
S2
MON1
MON2
TILTN
TLN
REN
FEN
MIRN
PW
MON1
MON2
NORM
MON
CTRL SWI
REG + LOGIC
SROUT
TEST
SIDA
SICL
SILD
RREF
I106 3100 10K
SERIAL BUS INTERF
I107 3103 47K -5VB
Q1
Q2
Q3
Q4
Q5
Q6
CMPP
TS1 F112
TS2 F113
EFMDP
EFMDN
EFMCP
EFMCN
TIMOUT F101
EfmDataP-S
EfmDataN-S
EfmClkP-S
EfmClkN-S
EFMTIM
TO ALFA CIRC
CTRL CURR
DACs
BANDGAP REF
GND1 GND2 GNDD VSS1 VSS2
NC 27 30 34 45 52 61 40 55 59 43
-5V 5104 I108 600R -5VB
2110 100n

CL 26532126_034.eps
221102

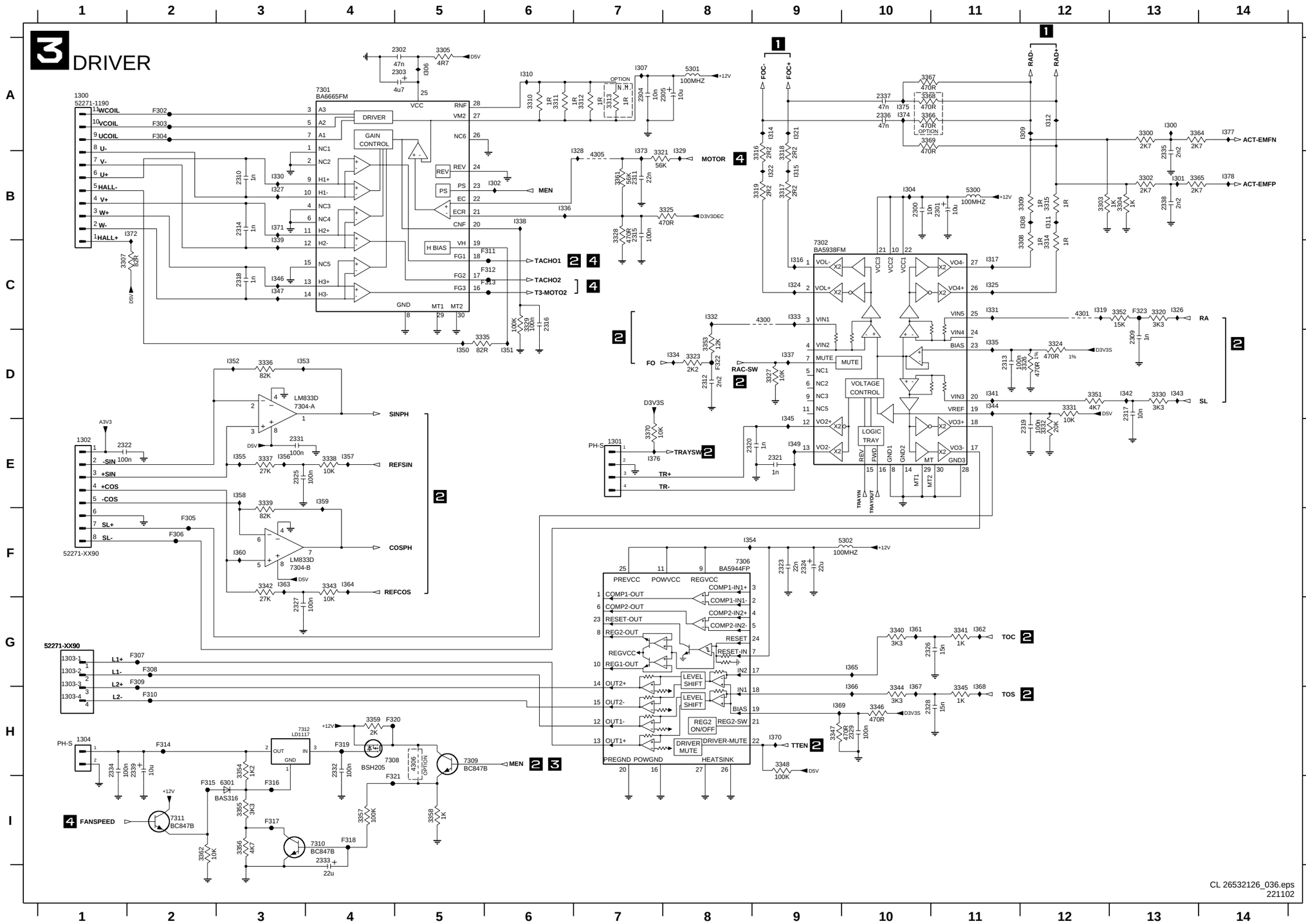
1100 A2
2100 B10
2101 C9
2102 B11
2104 D12
2105 D12
2106 D12
2110 H11
2111 C2
2116 F4
2121 D9
2122 E12
2125 C12
2126 B4
2127 B5
3100 F12
3101 C9
3102 G4
3103 G12
3105 G4
3107 D9
3108 D12
3114 F2
3115 G2
3121 F4
3122 F5
3129 E11
3130 C12
3131 C4
3132 C5
5100 B10
5102 B12
5104 G10
7101 B10
F101 G9
F102 C11
F104 C13
F105 C13
F106 C13
F107 D2
F108 E2
F109 F11
F121 F4
F127 F2
F128 G2
F129 C11
F130 C13

Servo Board 123 43353: MACE3

2 MACE3



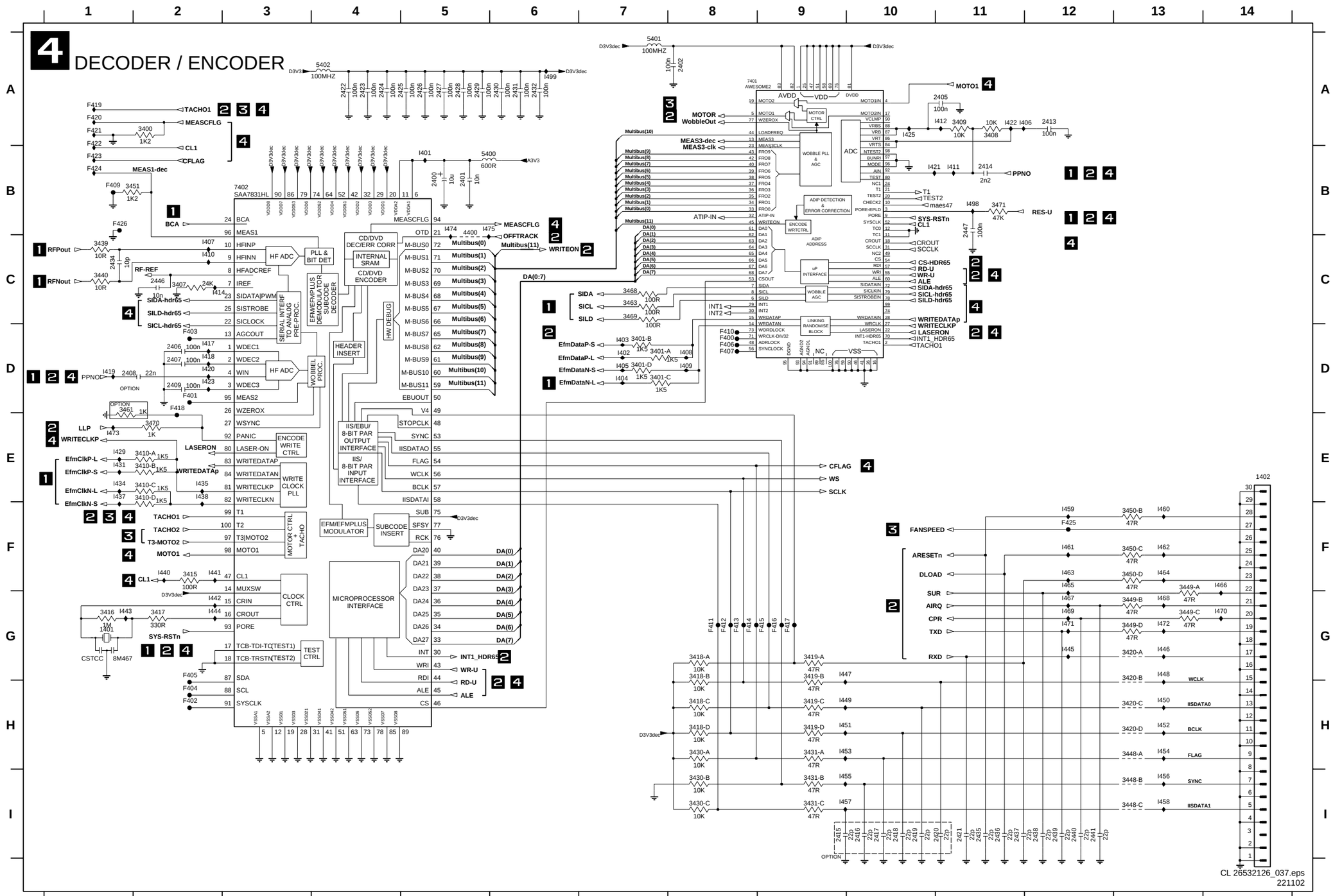
Servo Board 123 43353: Driver



1300 A1
1301 E7
1302 E1
1303-1 G1
1303-2 G1
1303-3 G1
1303-4 H1
1304 H1
2300 B10
2301 B11
2302 A5
2303 A5
2304 A7
2305 A8
2309 D13
2310 B3
2311 B7
2312 D8
2313 D11
2314 B3
2315 B7
2316 C6
2317 D13
2318 C3
2319 E12
2320 E8
2321 E9
2322 E1
2323 F9
2324 F9
2325 E3
2326 G10
2327 G3
2328 H10
2329 H10
2331 E3
2332 H4
2333 I4
2334 H1
2335 B13
2336 A10
2337 A10
2338 B13
2339 H2
3300 A13
3302 B13
3303 B12
3304 B13
3305 A5
3307 C1
3308 C12
3309 B12
3310 A6
3311 A6
3312 A7
3313 A7
3314 C12
3315 B12
3316 B9
3317 B9
3318 B9
3319 B9
3320 C13
3321 B7
3323 D8
3324 D12
3325 B8
3326 D12
3327 D9
3328 B7
3329 C6
3330 D13
3331 D12
3332 E12
3335 D5
3336 D3
3337 E3
3338 E4
3339 E3
3340 G10
3341 G11
3342 F3
3343 F4
3344 H10
3345 H11
3346 H10
3347 H9
3348 H9
3351 D12
3352 C13
3353 D8
3354 H3
3355 I3
3356 I3
3357 I4
3358 I5
3359 H4
3361 B7
3362 I2
3364 A13
3365 B13
3366 A10
3367 A10
3368 A10
3369 A10
3370 E7
4300 C9
4301 C12
4305 B7
4306 H5
5300 B11
5301 A8
5302 F10
6301 I3
7301 A4
7302 C9
7304-A D3
7304-B F3
7306 F8
7308 H4
7309 H5
7310 I4
7311 I2
7312 H4
F302 A2
F303 A2
F304 A2
F305 F2
F306 F2
F307 G2
F308 G2
F309 G2
F310 H2
F311 C6
F312 C6
F313 C6
F314 H2
F315 I2
F316 I3
F317 I3
F318 I4
F319 H4
F320 H4
F321 I4
F322 D8
F323 C13

Servo Board 123 43353: Decoder / Encoder

4 DECODER / ENCODER



1401 G1 F425 F12
1402 E14 F426 B1
2400 B5
2401 B5
2402 A8
2405 A11
2406 D2
2407 D2
2408 D1
2409 D2
2413 A12
2414 B11
2415 I9
2416 I10
2417 I10
2418 I10
2419 I10
2420 I11
2421 I11
2422 A4
2423 A4
2424 A4
2425 A5
2426 A5
2427 A5
2428 A5
2429 A5
2430 A6
2431 A6
2432 A6
2434 C1
2435 I11
2436 I11
2438 I12
2439 I12
2440 I12
2441 I12
2446 C2
2447 B11
3400 A2
3401-A D7
3401-B D7
3401-C D7
3401-D D7
3407 C2
3408 A11
3409 A11
3410-A E2
3410-B E2
3410-C E2
3410-D E2
3415 F2
3416 G1
3417 G2
3418-A G8
3418-B G8
3418-C H8
3418-D H8
3419-A G9
3419-B G9
3419-C H9
3419-D H9
3420-A G13
3420-B G13
3420-C H13
3420-D H13
3430-A H8
3430-B I8
3430-C I8
3431-A H9
3431-B I9
3431-C I9
3439 C1
3440 C1
3448-A H13
3448-B I13
3448-C I13
3449-A F13
3449-B G13
3449-C G13
3449-D G13
3450-B F13
3450-C F13
3450-D F13
3451 B1
3461 D1
3463 C7
3468 C7
3469 C7
3470 E2
3471 B11
4400 B5
5400 B5
5401 A7
5402 A4
7401 A8
7402 B3
F400 D8
F401 D2
F402 H2
F403 D2
F404 H2
F405 G2
F406 D8
F407 D8
F409 B1
F410 D8
F411 G8
F412 G8
F413 G8
F414 G8
F415 G9
F416 G9
F417 G9
F418 D2

Servo Board 123 43353: Power

1000 C2
1500 H2
1501 H3
2002 D6
2003 D7
2004 D7
2005 D7
2008 G7
2009 G7
2010 D9
2011 D9
2012 D9
2013 D10
2014 F8
2015 F8
2016 F9
2017 F9
2018 G9
2019 G9
2020 E9
3005 E8
3006 F9
4000 C5
4001 C5
7000 E8
7001 G8
F001 G10

5 POWER

POS TESTING

1000 PH-S
F002 F003 F004 F005 F006 F007 F008 F009
I015 I016

4000 I006 I007 I008
4001 I009 I010
I011
I012

D3V3
A3V3
+5V
D5V
-5V
+12V

2002 10n 2003 10u
2004 10n 2005 10u
2010 10n 2011 10u
2012 10n 2013 10u
I017 I018

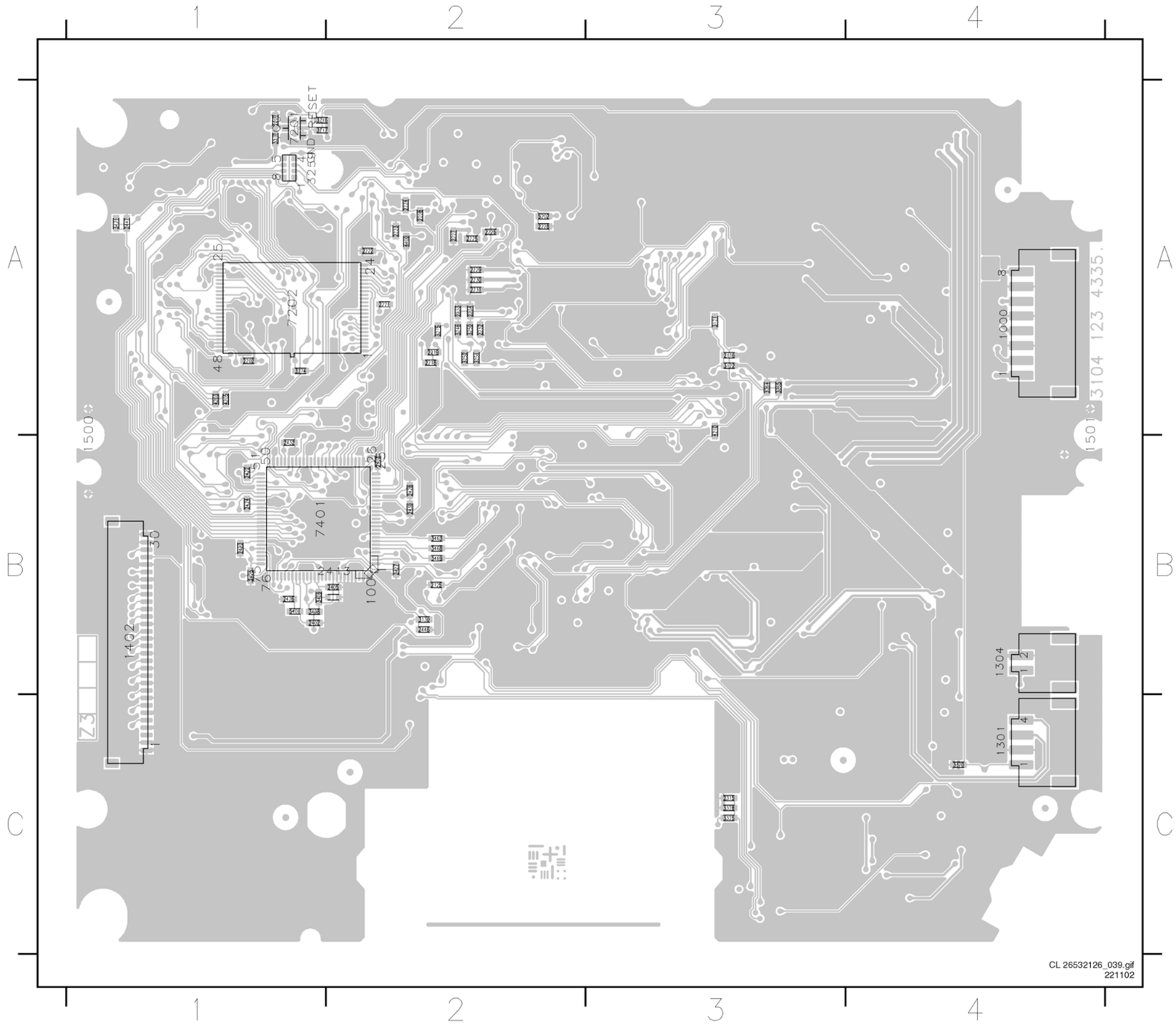
7000 LM337
I014
Vbias
3005 120R 2001 100n
I013
2014 1u
2015 100n
3006 43R
2016 10u
2017 10n

7001 LF33CD
F001
+3V3E
2008 10n 2009 10u
2018 100n
2019 10u

1500 Earth hole
I019
1501 Earth hole
I020

CL 26532126_038.eps
221102

Layout Servo Board 123 43353 (Top Side)



1000 A4
1301 C4
1304 B4
1402 B1
2116 A3
2125 B2
2202 A1
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2208 A2
2218 A2
2219 A2
2221 A2
2222 A2
2223 A2
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2227 A2
2228 A2
2229 A2
2230 A2
2231 A2
2232 A2
2233 A2
2234 A2
2315 C3
2402 B1
2405 B2
2413 B2
2422 B1
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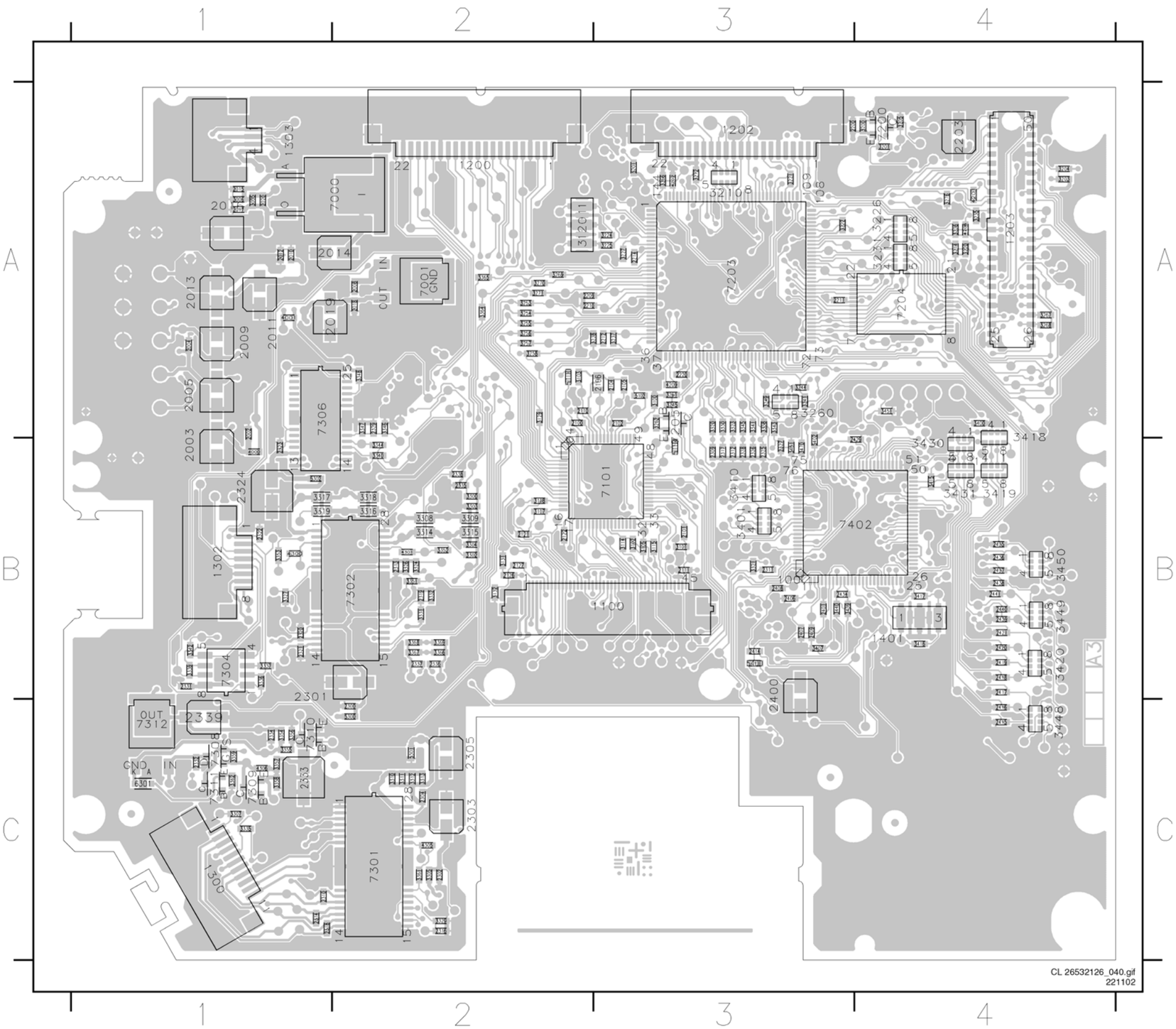
2424 B1
2425 B1
2426 B1
2427 B2
2428 B2
2430 B2
2431 B2
2432 B1
2446 B2
2447 A1
3121 A3
3122 A3
3130 B2
3216 A1
3217 A1
3246 A2
3250 A2
3251 A2
3252 A2
3259 A1
3264 A3
3265 A3
3274 A1
3275 A2
3277 A1
3325 C3
3328 C3
3370 C4
3408 B1
3409 B1
3463 B2
3468 B2
3469 B2
3471 A1
4203 A1
4205 A1
4210 A3
4400 A2
5202 A2
5401 B1
7201 A1
7202 A1
7401 B1

Layout Servo Board 123 43353 (Bottom Side)



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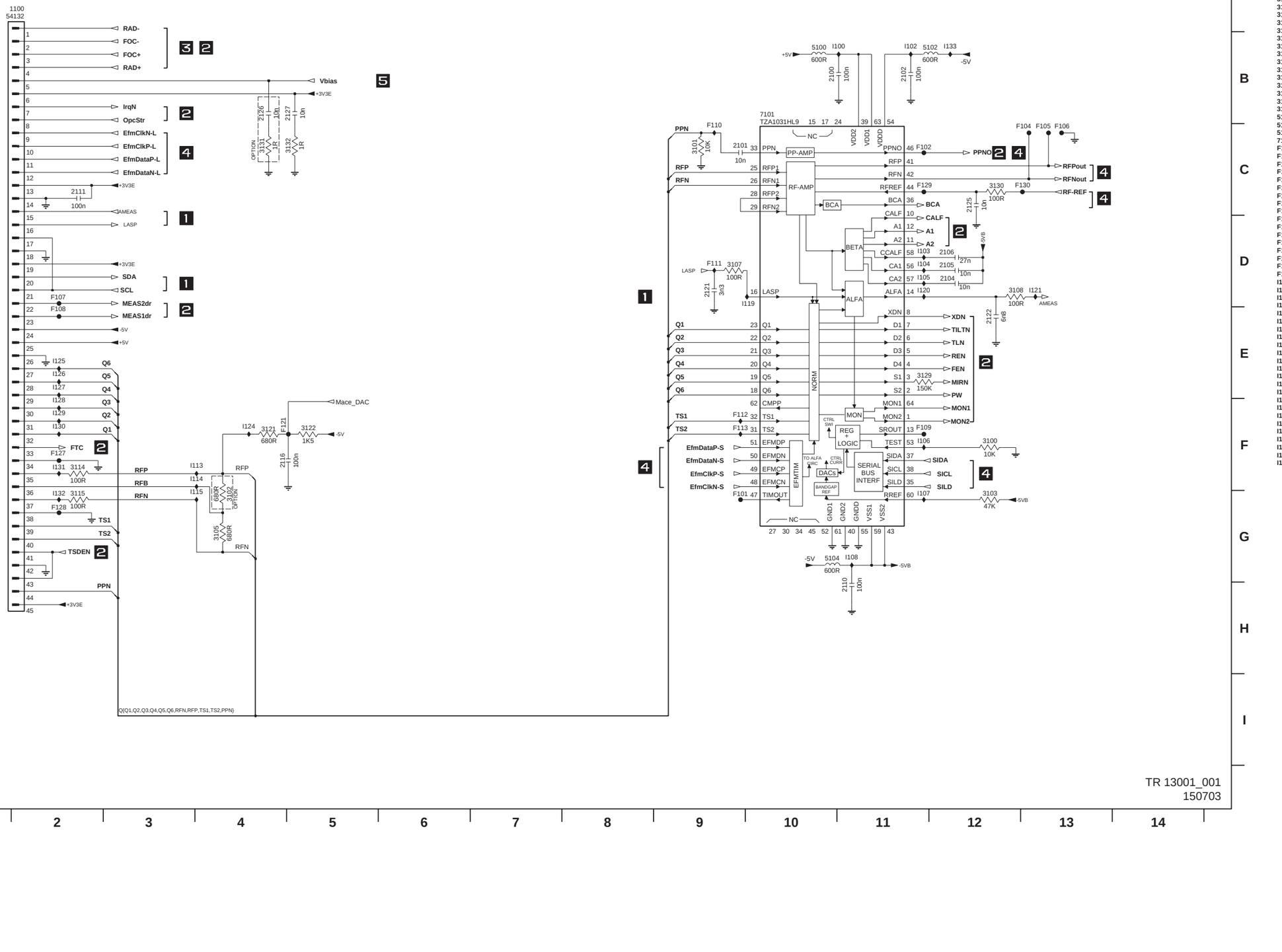
1200	A2	2327	B3	3241	A3	3356	C1	7402	B4
1201	A2	2328	B3	3244	A3	3357	C1		
1202	A3	2329	A2	3245	A3	3358	C1		
1203	A4	2331	B1	3249	A3	3359	C1		
1300	C1	2332	C1	3253	A2	3361	C2		
1302	B1	2333	C1	3254	A2	3362	C1		
1303	A1	2334	C1	3255	A2	3364	A2		
1401	B4	2335	B2	3256	A2	3365	A2		
2002	A1	2336	B2	3257	A2	3366	B2		
2003	B1	2337	B2	3258	A2	3367	B2		
2004	A1	2338	B2	3260	A3	3368	B2		
2005	A1	2339	C1	3261	A3	3369	B2		
2008	A2	2400	B3	3262	A3	3400	A4		
2009	A1	2401	B3	3266	A3	3401	B3		
2010	A1	2406	B3	3267	A4	3407	B3		
2011	A1	2407	B3	3268	A4	3410	B3		
2012	A1	2408	B3	3269	A2	3415	B4		
2013	A1	2409	B3	3270	A2	3416	B4		
2014	A2	2414	B3	3271	A2	3417	B4		
2015	A1	2415	C4	3272	A3	3418	A4		
2016	A1	2416	C4	3276	A4	3419	B4		
2017	A1	2417	B4	3300	B2	3420	B4		
2018	A2	2418	B4	3302	B2	3430	B4		
2019	A1	2419	B4	3303	B2	3431	B4		
2020	A1	2420	B4	3304	B2	3439	B3		
2100	A2	2421	B4	3305	C2	3440	B3		
2101	B3	2429	B4	3307	C1	3448	C4		
2102	A3	2434	B3	3308	B2	3449	B4		
2104	A3	2435	B4	3309	B2	3450	B4		
2105	A3	2436	B4	3310	C2	3451	A4		
2106	A3	2437	B4	3311	C2	3461	B3		
2110	A2	2438	B4	3312	C2	3470	B3		
2111	B3	2439	B4	3313	C2	4000	B1		
2121	B2	2440	B4	3314	B2	4001	A1		
2122	B2	2441	B4	3315	B2	4201	A4		
2126	B2	3005	A1	3316	B2	4202	A3		
2127	B2	3006	A1	3317	B1	4206	A4		
2200	A3	3100	A3	3318	B2	4209	A3		
2203	A4	3101	B3	3319	B1	4300	B1		
2209	A2	3102	B3	3320	A3	4301	B2		
2210	A2	3103	A2	3321	B3	4305	C2		
2211	A3	3105	B3	3323	A3	4306	C1		
2212	A3	3107	B2	3324	B2	5100	A2		
2214	A3	3108	B2	3326	B2	5102	A3		
2220	A3	3114	B3	3327	B1	5104	B3		
2300	C2	3115	B3	3329	C2	5201	A3		
2301	B1	3129	A2	3330	A3	5300	C2		
2302	C2	3131	B2	3331	B2	5301	C2		
2303	C2	3132	B2	3332	B2	5302	B1		
2304	C2	3200	A4	3335	C1	5400	B3		
2305	C2	3201	A4	3336	B1	5402	B3		
2309	B3	3203	A4	3337	B1	6301	C1		
2310	C1	3204	A4	3338	A3	7000	A2		
2311	B3	3205	A4	3339	B1	7001	A2		
2312	B3	3210	A3	3340	B2	7101	B3		
2313	B2	3214	A4	3341	A3	7200	A4		
2314	C1	3220	A4	3342	B1	7203	A3		
2316	C2	3221	A3	3343	A3	7204	A4		
2317	B3	3222	A3	3344	B2	7205	A3		
2318	C1	3224	A3	3345	A3	7301	C2		
2319	B2	3225	A3	3346	A2	7302	B2		
2320	B1	3226	A4	3347	A2	7304	B1		
2321	B1	3227	A3	3348	A2	7306	A1		
2322	B1	3231	A4	3351	B2	7308	C1		
2323	B1	3235	A4	3352	B2	7309	C1		
2324	B1	3236	A4	3353	B1	7310	C1		
2325	B3	3237	A3	3354	C1	7311	C1		

Servo Board 123 43661: Pre- Processor

1 PRE-PROCESSOR



TR 13001_001
150703

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2100 B10
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2102 B11
2104 D12
2105 D12
2106 D12
2110 H11
2111 C2
2116 F4
2121 D9
2122 E12
2125 C12
2126 B4
2127 B5
3100 F12
3101 C9
3102 G4
3103 G12
3105 G4
3107 D9
3108 D12
3114 F2
3115 G2
3121 F4
3122 F5
3129 E11
3130 C12
3131 C4
3132 C5
5100 B10
5102 B12
5104 G10
7101 B10
F101 G9
F102 C11
F104 C13
F105 C13
F106 C13
F107 D2
F108 E2
F109 F11
F110 C9
F111 D9
F112 F9
F113 F9
F121 F4
F127 F2
F128 G2
F129 C11
F130 C13
I100 B11
I102 B11
I103 D11
I104 D11
I105 D11
I106 F11
I107 G11
I108 G11
I113 F4
I114 F4
I115 G4
I119 D10
I120 D11
I121 D13
I124 F4
I125 E2
I126 E2
I127 E2
I128 F2
I129 F2
I130 F2
I131 F2
I132 G2
I133 B12

Servo Board 123 43661: MACE3

2 MACE3

1200 52207-2290
SINPH
COSPH
XDN
A1
A2
CALF
VRIN
TILTN
TLN
REN
FEN
MIRN
PW
FTC
MON1
MON2
MEAS1dr
MEAS2dr
PPNO

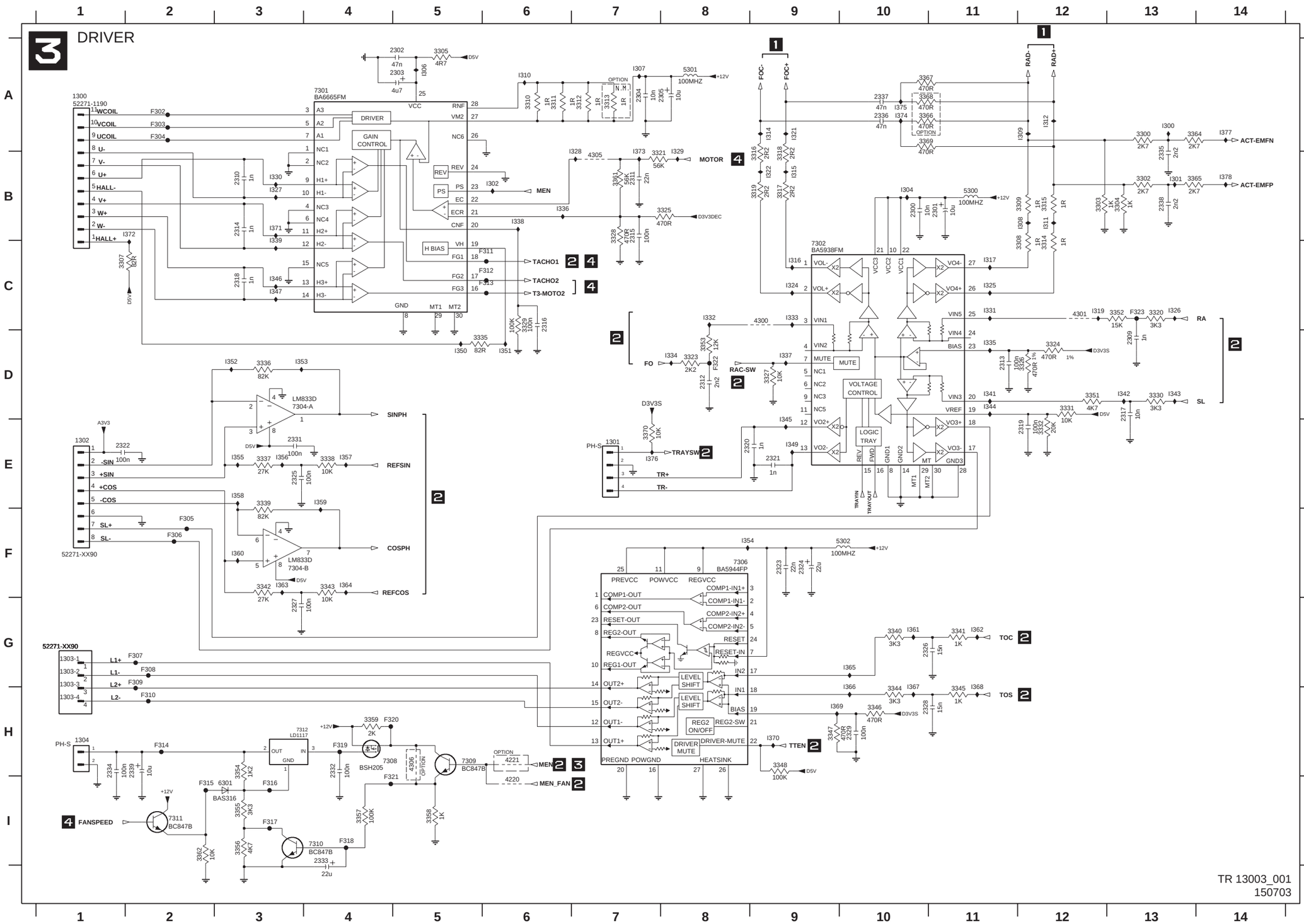
1202 52207-2290
LASERON
WRITEON
WobbleOut
EAN-WAITN
TERMINAL
IrqN
ARESETn
LLP
OFFTRACK
DEBMOVXD
DEBMOVXA
DEBSERVO
DEBCLOCK
INT-HDR65
INT-GA
TACHO1
SCLM
SDAM

7201 ADM810 RESET GND
7203 SAA7830HL
CSTCC 8M467
7205 BC857B
7204 CY7C1399
7202 M29W400BT
7206 BC857B
TRACE_DAC

1200 B1
1201 G5
1202 F1
1203 G18
2200 B11
2202 C15
2203 D15
2207 E5
2208 E10
2209 I6
2210 I6
2211 H16
2212 J6
2214 N18
2218 N14
2219 N14
2220 N15
2221 N15
2222 N15
2223 N15
2224 N15
2225 N16
2226 N16
2227 N16
2228 N16
2229 I5
2230 I5
2231 I6
2232 N18
2233 N9
2234 N9
3200 B12
3201 B12
3203 C16
3204 D16
3205 C12
3210-A D10
3210-B D9
3210-C D9
3210-D D9
3214 H15
3216 C12
3217 C12
3220 G15
3221 C11
3222 E13
3224 F5
3225 G6
3226-A G13
3226-B G13
3226-C G13
3226-D G13
3227 G6
3231-A G13
3231-B G13
3231-C H13
3231-D H13
3235 I18
3236 H14
3237 J6
3238 K5
3241 M11
3244 M11
3245 M7
3246 M9
3249 N11
3250 M9
3251 N8
3252 N8
3253 I6
3254 I6
3255 J6
3256 J6
3257 J6
3258 J6
3259-A D8
3259-B C12
3259-C C12
3260-A M11
3260-B M11
3260-C M11
3261 L8
3262 M6
3264 E2
3265 E3
3266 E7
3267 F13
3268 F13
3269 H5
3270 H5
3271 I5
3272 D8
3274 M11
3275 L11
3276 L11
3277 D5
4201 E7
4202 E7
4203 F13
4205 F13
4206 H14
4209 L7
4210 E2
5201 M18
5202 M14
7200 B12
7201 E6
7202 D15
7203 E7
7204 H15
7205 M6
F210 F6
F211 F6
F212 F6
F213 F6
F214 H6
F215 I6
F216 K7
F217 K7
F218 K7
F222 K9
F223 K9
F228 D2
F229 D2
F232 E7
F237 F13
F238 F13
F239 M11
F240 H6
F241 H6
F242 H6

Servo Board 123 43661: Driver

3 DRIVER



1300 A1	7304-B F3
1301 E7	7306 F8
1302 E1	7308 H4
1303-1 G1	7309 H5
1303-2 G1	7310 I4
1303-3 G1	7311 I2
1303-4 H1	7312 H4
1304 H1	F302 A2
2300 B10	F303 A2
2301 B11	F304 A2
2302 A5	F305 F2
2303 A5	F306 F2
2304 A7	F307 G2
2305 A8	F308 G2
2309 D13	F309 G2
2310 B3	F310 H2
2311 B7	F311 C6
2312 D8	F312 C6
2313 D11	F313 C6
2314 B3	F314 H2
2315 B7	F315 I2
2316 C6	F316 I3
2317 D13	F317 I3
2318 C3	F318 I4
2319 E12	F319 H4
2320 E8	F320 H4
2321 E9	F321 I4
2322 E1	F322 D8
2323 F9	F323 C13
2324 F9	
2325 E3	
2326 G10	
2327 G3	
2328 H10	
2329 H10	
2331 E3	
2332 H4	
2333 I4	
2334 H1	
2335 B13	
2336 A10	
2337 A10	
2338 B13	
2339 H2	
3300 A13	
3302 B13	
3303 B12	
3304 B13	
3305 A5	
3307 C1	
3308 C12	
3309 B12	
3310 A6	
3311 A6	
3312 A7	
3313 A7	
3314 C12	
3315 B12	
3316 B9	
3317 B9	
3318 B9	
3319 B9	
3320 C13	
3321 B7	
3323 D8	
3324 D12	
3325 B8	
3326 D12	
3327 D9	
3328 B7	
3329 C6	
3330 D13	
3331 D12	
3332 E12	
3335 D5	
3336 D3	
3337 E3	
3338 E4	
3339 E3	
3340 G10	
3341 G11	
3342 F3	
3343 F4	
3344 H10	
3345 H11	
3346 H10	
3347 H9	
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3352 C13	
3353 D8	
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3355 I3	
3356 I3	
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3364 A13	
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3366 A10	
3367 A10	
3368 A10	
3369 A10	
3370 E7	
4300 C9	
4301 C12	
4305 B7	
4306 H5	
5300 B11	
5301 A8	
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7301 A4	
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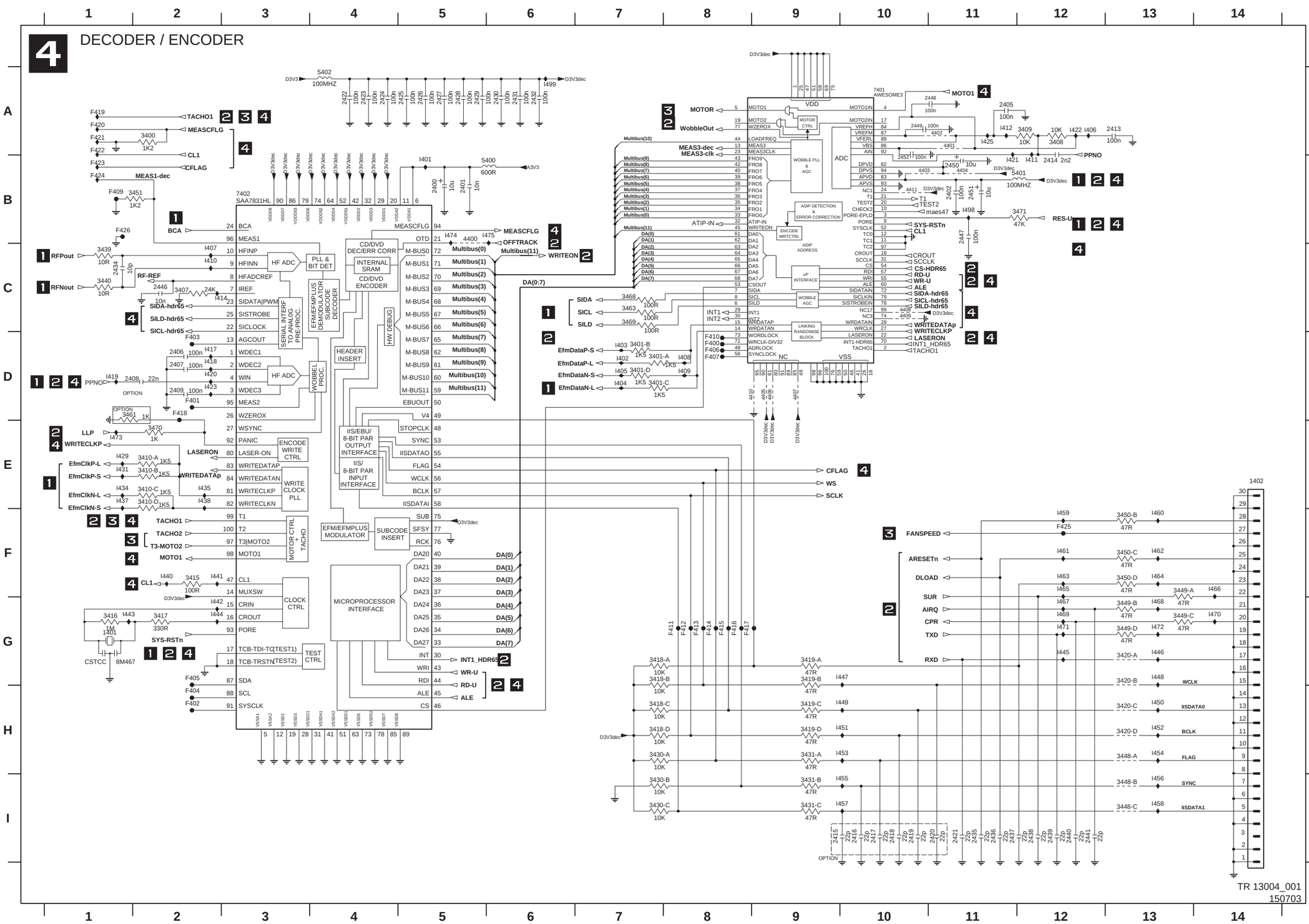
7304-A D3	

Servo Board 123 43661: Decoder/Encoder

4 DECODER / ENCODER



1401 G1	F404 H2	3418-A G7	I451 H10
1402 E14	F405 G2	3418-B G7	I452 H13
2400 B5	F406 D8	3418-C H7	I453 H10
2401 B5	F407 D8	3418-D H7	I454 H13
2402 B11	F409 B1	3419-A G9	I455 I10
2405 A11	F410 D8	3419-B G9	I456 I13
2406 D2	F411 G8	3419-C H9	I457 I10
2407 D2	F412 G8	3419-D H9	I458 I13
2408 D1	F413 G8	3420-A G13	I459 F12
2409 D2	F414 G8	3420-B G13	I460 F13
2413 A13	F415 G8	3420-C H13	I461 F12
2414 B12	F416 G8	3420-D H13	I462 F13
2415 I9	F417 G8	3430-A H7	I463 F12
2416 I10	F418 D2	3430-B I7	I464 F13
2417 I10	F419 A1	3430-C I7	I465 F12
2418 I10	F420 A1	3431-A H9	I466 F14
2419 I10	F421 A1	3431-B I9	I467 G12
2420 I11	F422 A1	3431-C I9	I468 G13
2421 I11	F423 B1	3439 C1	I469 G12
2422 A4	F424 B1	3440 C1	I470 G14
2423 A4	F425 F12	3448-A H13	I471 G12
2424 A4	F426 B1	3448-B I13	I472 G13
2425 A5	I401 B5	3448-C I13	I473 E1
2426 A5	I402 D7	3449-A F13	I474 B5
2427 A5	I403 D7	3449-B G13	I475 B6
2428 A5	I404 D7	3449-C G13	I498 B11
2429 A5	I405 D7	3449-D G13	I499 A6
2430 A6	I406 A12	3450-B F13	
2431 A6	I407 C2	3450-C F13	
2432 A6	I408 D8	3450-D F13	
2434 C1	I409 D8	3451 B2	
2435 I11	I410 C2	3461 D1	
2436 I11	I411 B12	3463 C7	
2437 I11	I412 A11	3468 C7	
2438 I12	I414 C2	3469 C7	
2439 I12	I417 D2	3470 E2	
2440 I12	I418 D2	3471 B12	
2441 I12	I419 D1	4400 B5	
2446 C2	I420 D2	4401 A11	
2447 B11	I421 B11	4402 A11	
2448 A11	I422 A12	4403 B10	
2449 A10	I423 D2	4404 B11	
2450 B11	I425 A11	4405 D9	
2451 B11	I429 E1	4406 D9	
2452 B10	I431 E1	4407 D9	
3400 A2	I434 E1	4408 C10	
3401-A D7	I435 E2	4409 C10	
3401-B D7	I437 E1	4410 D9	
3401-C D7	I438 E2	4411 B10	
3401-D D7	I440 F2	5400 B6	
3407 C2	I441 F2	5401 B12	
3408 A12	I442 G2	5402 A4	
3409 A12	I443 G1	7401 A10	
3410-A E2	I444 G2	7402 B3	
3410-B E2	I445 G12	F400 D8	
3410-C E2	I446 G13	F401 D2	
3410-D E2	I447 G10	F402 H2	
3415 F2	I448 G13	F403 D2	
3416 G1	I449 H10		
3417 G2	I450 H13		

Servo Board 123 43661: Power

5 POWER

POS TESTING

1000 PH-S
F002 F003 F004 F005 F006 F007 F008 F009
I015 I016

4000 4001
I006 I007 I008 I009 I010 I011 I012

D3V3
A3V3
+5V
D5V
-5V
+12V

2002 10n 2003 10u 2004 10n 2005 10u
2010 10n 2011 10u 2012 10n 2013 10u
I017 I018

7000 LM337
I013 I014
3005 220R 2020 100n
2014 1u 2015 100n 3006 43R 2016 10u 2017 10n
Vbias

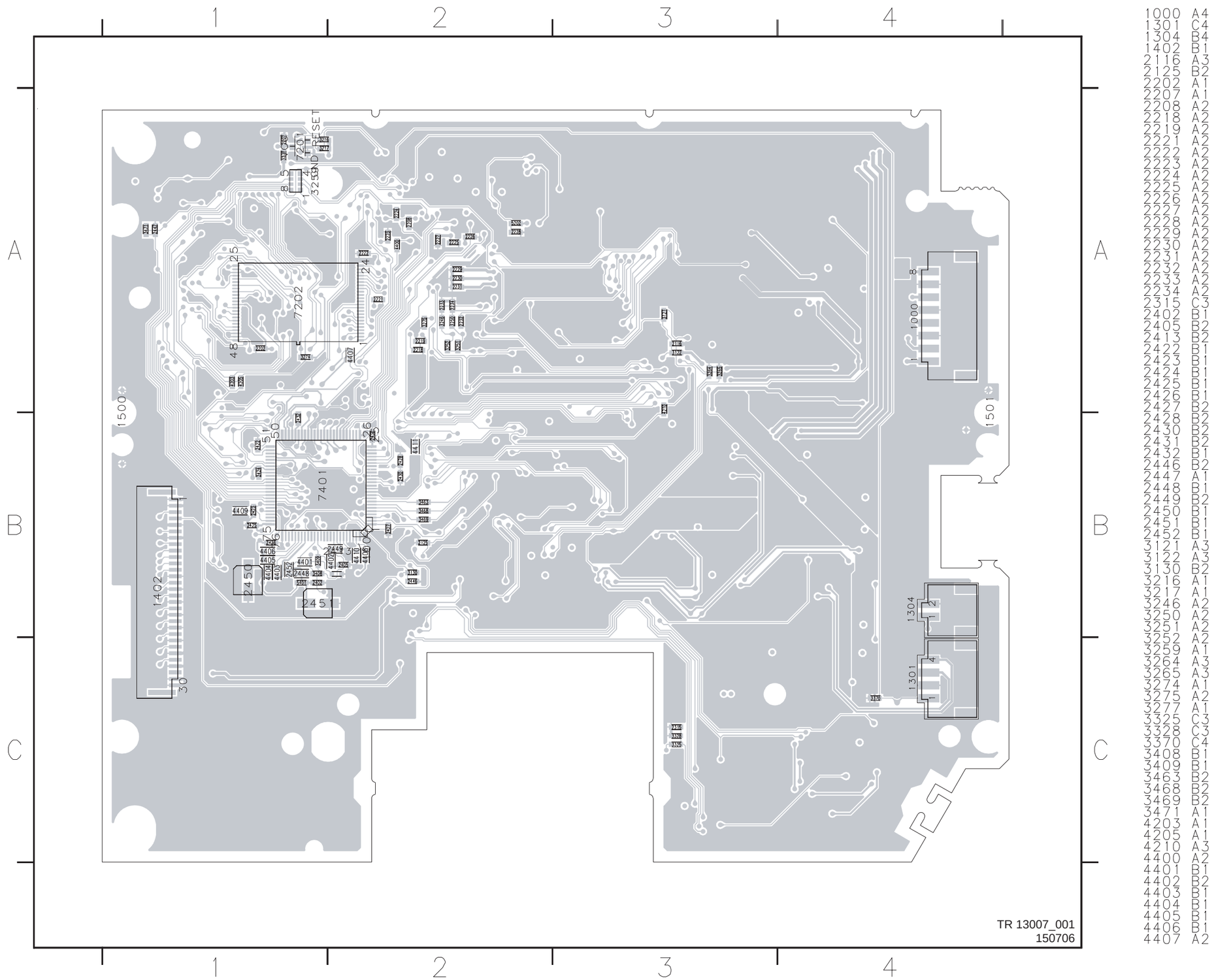
7001 LF33CD
F001
2008 10n 2009 10u 2018 100n 2019 10u
+3V3E

1500 Earth hole I019
1501 Earth hole I020

1000 C2
1500 H2
1501 H3
2002 E6
2003 E7
2004 E7
2005 E7
2008 G7
2009 G7
2010 E9
2011 E9
2012 E9
2013 E10
2014 F8
2015 F8
2016 F9
2017 F9
2018 G9
2019 G9
2020 E9
3005 E8
3006 F9
4000 C5
4001 C5
7000 E8
7001 G8
F001 G10
F002 C2
F003 C2
F004 C2
F005 C2
F006 D2
F007 D2
F008 D2
F009 D2
I006 C5
I007 C5
I008 C5
I009 C5
I010 C5
I011 D5
I012 D5
I013 F8
I014 E9
I015 D3
I016 D3
I017 D10
I018 D11
I019 H1
I020 H2

TR 13005_001
150703

Layout Servo Board 123 43661 (Top Side)



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2221 A2
2222 A2
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2232 A2
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4403 B1
4404 B1
4405 B1
4406 B1
4407 A2
4408 B2
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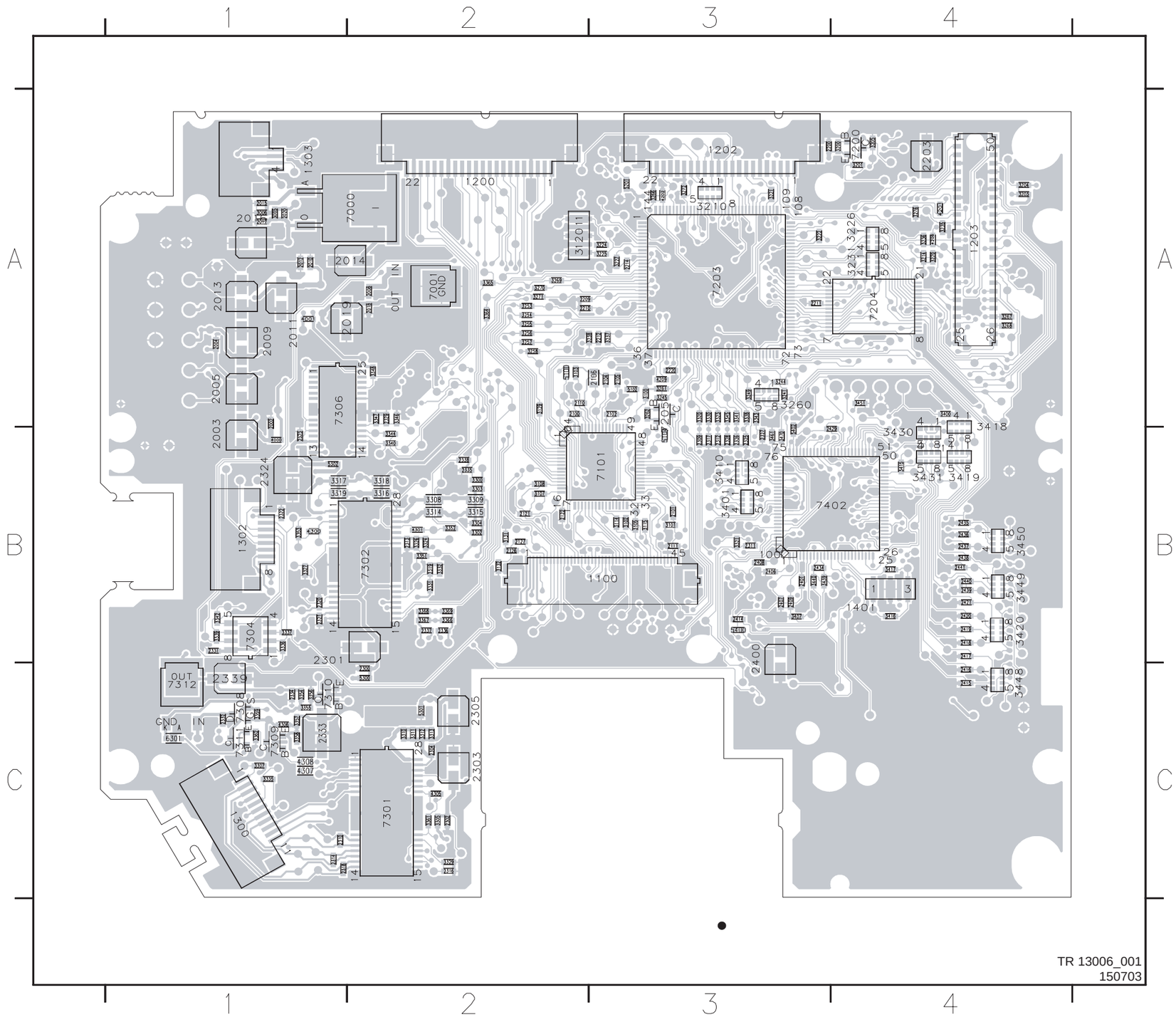
7202 A1
7401 B1

Layout Servo Board 123 43661 (Bottom Side)



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1200	A2	2400	B3	3304	B2	4206	A4
1201	A2	2401	B3	3305	C2	4209	A3
1202	A3	2406	B3	3307	C1	4300	B1
1203	A4	2407	B3	3308	B2	4301	B2
1300	C1	2408	B3	3309	B2	4305	C2
1302	B1	2409	B3	3310	C2	4306	C1
1303	A1	2414	B3	3311	C2	4307	C1
1401	B4	2415	C4	3312	C2	4308	C1
2002	A1	2416	C4	3313	C2	5100	A2
2003	B1	2417	B4	3314	B2	5102	A3
2004	A1	2418	B4	3315	B2	5104	B3
2005	A1	2419	B4	3316	B2	5201	A3
2008	A2	2420	B4	3317	B1	5300	C2
2009	A1	2421	B4	3318	B2	5301	C2
2010	A1	2429	B4	3319	B1	5302	B1
2011	A1	2434	B3	3320	A3	5400	B3
2012	A1	2435	B4	3321	B3	5402	B3
2013	A1	2436	B4	3323	A3	6301	C1
2014	A2	2437	B4	3324	B2	7000	A2
2015	A1	2438	B4	3326	B2	7001	A2
2016	A1	2439	B4	3327	B1	7101	B3
2017	A1	2440	B4	3329	C2	7200	A4
2018	A2	2441	B4	3330	A3	7203	A3
2019	A1	3005	A1	3331	B2	7204	A4
2020	A1	3006	A1	3332	B2	7205	A3
2100	A2	3100	A3	3335	C1	7301	C2
2101	B3	3101	B3	3336	B1	7302	B2
2102	A3	3102	B3	3337	B1	7304	B1
2104	A3	3103	A2	3338	A3	7306	A1
2105	A3	3105	B3	3339	B1	7308	C1
2106	A3	3107	B2	3340	B2	7309	C1
2110	A2	3108	B2	3341	A3	7310	C1
2111	B3	3114	B3	3342	B1	7311	C1
2121	B2	3115	B3	3343	A3	7312	C1
2122	B2	3129	A2	3344	B2	7402	B4
2126	B2	3131	B2	3345	A3		
2127	B2	3132	B2	3346	A2		
2200	A3	3200	A4	3347	A2		
2203	A4	3201	A4	3348	A2		
2209	A2	3203	A4	3351	B2		
2210	A2	3204	A4	3352	B2		
2211	A3	3205	A4	3353	B1		
2212	A3	3210	A3	3354	C1		
2214	A3	3214	A4	3355	C1		
2220	A3	3220	A4	3356	C1		
2300	C2	3221	A3	3357	C1		
2301	B1	3222	A3	3358	C1		
2302	C2	3224	A3	3359	C1		
2303	C2	3225	A3	3361	C2		
2304	C2	3226	A4	3362	C1		
2305	C2	3227	A3	3364	A2		
2309	B3	3231	A4	3365	A2		
2310	C1	3235	A4	3366	B2		
2311	B3	3236	A4	3367	B2		
2312	B3	3237	A3	3368	B2		
2313	B2	3238	A2	3369	B2		
2314	C1	3241	A3	3400	A4		
2316	C2	3244	A3	3401	B3		
2317	B3	3245	A3	3407	B3		
2318	C1	3249	A3	3410	B3		
2319	B2	3253	A2	3415	B4		
2320	B1	3254	A2	3416	B4		
2321	B1	3255	A2	3417	B4		
2322	B1	3256	A2	3418	A4		
2323	B1	3257	A2	3419	B4		
2324	B1	3258	A2	3420	B4		
2325	B3	3260	A3	3430	B4		
2326	B3	3261	A3	3431	B4		
2327	B3	3262	A3	3439	B3		
2328	B3	3266	A3	3440	B3		
2329	A2	3267	A4	3448	C4		
2331	B1	3268	A4	3449	B4		
2332	C1	3269	A2	3450	B4		
2333	C1	3270	A2	3451	A4		
2334	C1	3271	A2	3461	B3		
2335	B2	3272	A3	3470	B3		
2336	B2	3276	A4	4000	B1		
2337	B2	3300	B2	4001	A1		
2338	B2	3302	B2	4201	A4		

8. Alignments

No alignments necessary

9. Circuit Descriptions, Abbreviation List, and Data Sheets

Index of this chapter:
1. Introduction
2. Block diagram
3. DVD-Mechanism
4. Optical Pickup Unit
5. Printed Wiring Board
6. Abbreviation list
7. IC Data Sheets

9.1 Introduction

The Video Engine consist of a DVD-Mechanism with dual laser Optical Pickup Unit (OPU), a tray loader with fan unit and a PWB containing all electronics to control the module. The electronics of the module is responsible for all basic servo tasks. It reads from and writes data onto the disc.

The PWB is a high tech module (multi layer, full SMC) with very high component density. Despite of this, it is designed in such a way, that repair on component level still is possible. Detailed diagnostics and fault finding is possible via ComPair.

Some specifications:
- Record DVD+RW
  - Loss less linking
  - Recording speed: 1.2 x
- Playback DVD
  - DVD+R(W), DVD (SL/DL), DVD-R, DVD-RW (V1.1)
  - Playback speed: 1.2 x
- Playback CD
  - CD-DA, CD-R, CD-RW, CD-ROM, VCD/SVCD
  - Playback speed: 3 x

9.2 Block Diagram

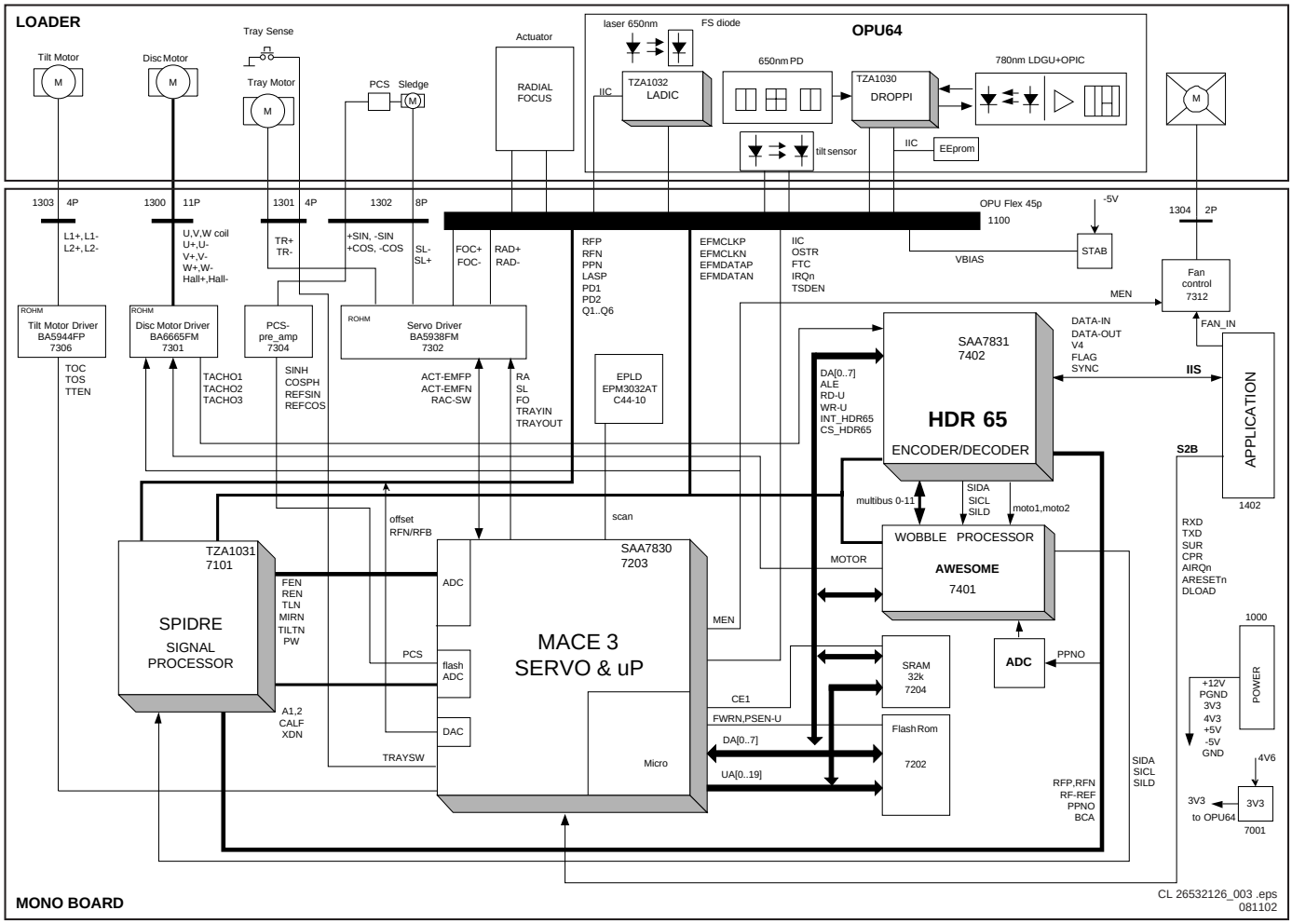


Figure 9-1 Block diagram Basic Engine

This section describes briefly the functional behaviour of the engine. It performs all basic servo functions:
- It reads data from the disc,
- It writes data to the disc,
- It controls all other functions like tray control, start/stop the disc, tracking, jumping, and communication to the host.

9.2.1 Initialisation process

After power-up or reset, a self-test will automatically start.

9.2.2 Starting up the drive

After the internal initialisation process has been finished, the engine will wait for the first S2B user command. E.g. “Tray_out".

9.2.3 Disc recognition process

The process of disc recognition when a disc is loaded is entirely performed within the engine. Information about the disc type is send to the MPEG application (back-end).

9.2.4 Write / Read process

Depending on the disc loaded and actions to be performed, Record, Play, Search, etc. a specific sequence of commands is executed depending on the implementation of the application.

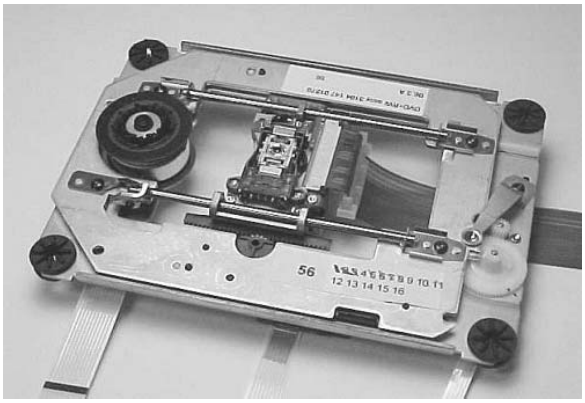
9.2.5 Shock behaviour during recording

Shock recovery during recording is performed by the application if the shock was too large to be absorbed by the engine. If the engine detects unacceptable servo behaviour, the laser will go into low power mode to protect overwriting of neighbour tracks. This action is signalised by the internal engine controller and reported to the application. The application can react on this with a shock recovery procedure.

9.2.6 Function overview VAE801x and MPEG application

The VAE801x performs all basic servo functions. It reads data from the disc and writes data to the disc, and controls all other functions like tray control, start/stop the disc, tracking, jumping, and communication to the host.

9.3 DVD-Mechanism



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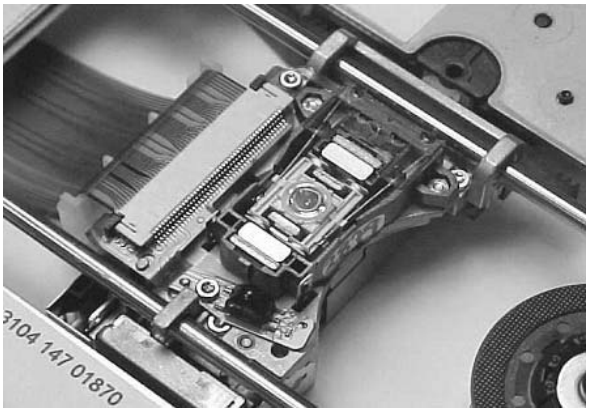
081102

Figure 9-2 DVD-M assy

The DVD-M has an optical pickup unit (OPU) consisting of two lasers, one for CD with a wavelength of 780 nm, and one for DVD with a wavelength of 650 nm.
The TZA1032 (LADIC) controls the data from these lasers, and the supply to them.

9.4 Optical Pickup Unit



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081102

Figure 9-3 Optical Pickup Unit (OPU)

The OPU 64 (Optical Pickup Unit) consists of the following components:
- DVD+RW Optics.
- High-power red laser.
- Tilt sensor.
- Flexible connections.
- LADIC: **L**aser **D**river **IC.**
- DROPPI: **D**VD **R**ewritable **O**PU **P**re-**P**rocessor **I**C.
- EEPROM with OPU adjustment data.

OPU-64 Flex foil pinning specifications:
- 45 pins.
- Actuator signals: Rad +/-, Foc +/-
- Pre-processed signals.
- PPN: normalized, balanced PP output.
- RFP, RFN, RFB: differential RF output.
- Clocks: OPC-strobe, EFMClk-N/P, SCL.
- Data: EFMData-N/P, SDA.
- Power supplies:
  - +3V3E: ‘clean’ power supply for LADIC
  - +5V, -5V: for DROPPI
- TSDEN: tilt sensor power
- V_{BIAS}: Laser bias voltage (~ -1.5 V)

9.4.1 DROPPI

The DROPPI (DVD Rewritable OPU Pre-Processor IC) is a multi-purpose analogue pre-processor IC for use in the OPU of an optical bit engine. The device supports many photo detector configurations and output signal modes for RF and servo signals.

Some features of the DROPPI:
- Two inputs:
  - Current: DVD photo-diode.
  - Voltage: CD PDIC.
- Only one wideband signal across flex foil:
  - RF (differential signal).
- Other signals have relatively low bandwidth:
  - Wobble signal.
  - Servo signals.

9.4.2 LADIC

The LADIC (Laser Driver IC, type number TZA1032) fulfils three main functions:

- It **drives** the laser with a sequence of programmable write strategy pulses with high timing accuracy and high peak current levels.
- It **encodes** the input modulated data to a sequence of write strategy pulses. This encoding is flexible with respect to input modulation code (EFM, EFM+, 17 pp, etc.). The write strategy is programmable with high flexibility for CD-R/RW and DVD-R/RW. For this purpose the TZA1032 includes two Random Access Memories (RAM) which can be loaded (non real-time) via the I2C-bus from microcontroller.
- It **controls** the exact light power levels coming from the laser and controls the exact power absorbed by the disc during recording.

The TZA1032 features three independent power supplies. These are the analogue and digital power supplies and a local power supply for the laser driver function. The supplies can be delivered separately to obtain maximum output performance of the TZA1032 in environments with large and highly dynamic current flows.

Some features of the LADIC:

- Single IC.
- Simple interface (EFM(+) Decoder, WSG, I2C Programming).
- Black-box laser.
- Temperature compensation.
- Dynamic power level control (“Alpha” control, OPC).
- Multi-application.
  - Highly programmable (control and write strategy),
  - Wide driver & frequency range.
- Under 500 mW dissipation in IC.

9.5 Printed Wiring Board

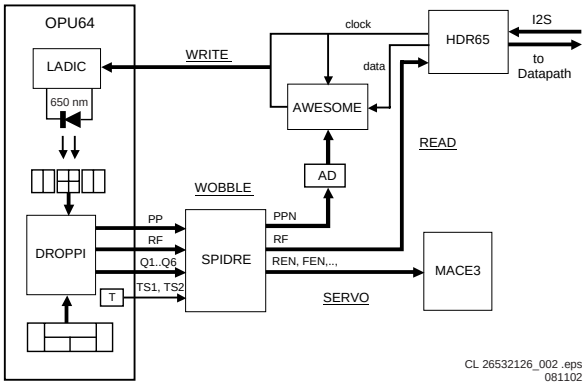


Figure 9-4 Signal path

9.5.1 SPIDRE

The SPIDRE (Signal Processing IC for Dvd REwritable) is a multi purpose analogue pre-processor IC specifically intended for writing applications. Its main task is normalisation of the servo signals that go to the MACE3 servo processor (signals like 'focus servo', 'radial servo', 'track loss servo', and 'tilt sensor').
It is possible to optimise the dynamic range of this pre-amp/ processor combination for the LF servo and RF data paths. The gain in both channels is separately programmable. This will guarantee an optimal playability for all kind of discs.
The SPIDRE is optimised to work with the optical pick-up unit pre-processor IC TZA1030 (DROPPI) and decoder IC HDR65.

Some features of the SPIDRE:

- A “Writer add-on”.
- Double-Writer prepared (both CDR/RW and DVDRW).
- Direct connection to HDR65/MACE3.
- High Performance:
  - 16 x DVD-ROM read.
  - 64 x CD-ROM read.
  - 16 x CDR/RW write.
  - 4 x DVD+RW write.
- Normalisation of servo signals.
- Programmable RF gain and AGC functionality.
- Separate push-pull signal (with own AGC).
- Three wire serial interface for programming of the device by a decoder IC or microcontroller.

9.5.2 MACE3 Servo and microprocessor

The MACE3 IC (Mini All Cd Engine, type number is SAA7830) is a combined servo processor and micro controller (80C51). See also the internal block diagram at the end of this chapter.

The servo front-end
The servo processor handles the signals for focusing, tracking, and access, but also generates the control signals for the loader block.
In a CD/DVD system, there are several control loops active. Some of them are needed to adjust the servo error signals (once per disc rotation). It also adjusts offsets, signal amplitudes, and loop gains (AGCs), to enlarge system robustness and to avoid expensive potentiometer adjustments in production.
The other loops determine the laser spot position on the disc in the radial, axial (focus), and tangential directions. It also has to take care that the spot accesses a required position as fast as possible. This access system consists of two parts, namely the actuator and the sled, which are (within a certain range) mechanically and electrically independent. Therefore, during an access, the servo has to control as well the actuator as the sled.
The analogue signals from the diode pre-processor are converted into a digital representation using A/D converters. The digital codes are then applied to logic circuitry to obtain the various control signals.

PCS (Position Control Sledge)
The PCS module is used to get fast sledge access. To achieve this, it is important that the sledge motor can rotate as fast as possible. But of course there is a limit to this maximum rotational speed. In order to let the sledge move even faster the ratio of the gearing can be reduced. However, if this ratio gets too low, the cogging/detent torque of the sledge motor will push the laser 'off track'.
There is a solution to this: Hold the sledge motor in its position by controlling the voltage on the motor continuously.
PCS is implemented in the following way:
A normal DC motor is used, combined with hall sensors. A DC sled motor has a magnetic ring mounted around the shaft. Above this magnetic ring are two hall sensors positioned 90 degrees apart. The two hall outputs, which go to the PCS control block, are 'sin phi' and 'cos phi'. The system tries to minimise the phase difference between the measured hall sine/ cosine inputs and a reference sin/cosine waveform.
When the sledge is in tracking, the sin/cosine wave is constant, so the sledge is kept at its current position. When after a while, the radial actuator drifts away, the capture point crawls a bit further on the hall sine. So the PCS makes a micro-step. When doing an access the servo processor keeps on stepping the sine/cosine table, thus generating a sine/cosine wave, which the sledge will follow.

OPC (Optimum Power Calibration)
This device has an integrated Optimum Power Calculation block for use in CD-R, CD-RW, and DVD-RAM applications. It

reads three analogue signals (A1, A2 and CALF), representing Max, Min, and Average values of the EFM signal respectively. It also takes the Power (PW) signal from the laser controller and then feeds an analogue signal (ALPHA0) out to control the laser power. The conversion frequency is 88KHz per channel. Basically, the OPC procedure tries to find out the optimum laser power to be used on a specific disc. It consists of three phases:

1. **WRITE** - Random EFM data is written to the test area of the disc at increasing levels of laser power (controlled by ALPHA0).
2. **READ** - The data on A1, A2, and CALF is read back from the test area and stored in memory.
3. **CALCULATION** - the embedded 8051 then calculates the setting of ALPHA0 where the least jitter is encountered. Some pre-processing is carried out by the OPC logic to reduce the processor's load.

This sequence is done twice - first a coarse calibration, followed by a fine-tuning.

The microprocessor

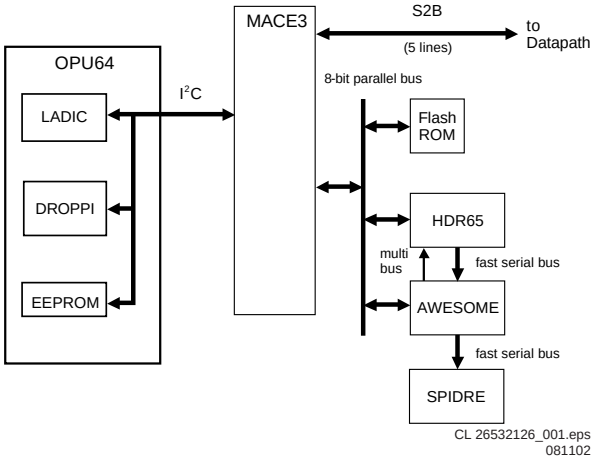


Figure 9-5 Control path

The micro controller processes the S2B commands from the DVD+RW interface (back-end), and controls the various processes in the OPU via I2C. Communication with the HDR65, SPIDRE, and memories is done via an eight bit parallel bus.

Some features:
- Dedicated hardwired DSP.
- 8051-based microprocessor.
- External Flash ROM and SRAM memory.

9.5.3 HDR65

The HDR65 has the following functions:
- **Encoder** for DVD+RW. This part creates the EFM+ (16 bit) signals from the I2S data stream.
- **Decoder** for DVD and CD. This part processes the HF-signal from the SPIDRE. It converts the EFM(+) signals to data, and performs error detection and error correction.
- Output to SPIDRE pre-processor for RF-AGC.

This IC decodes EFM or EFM+HF signals directly from the laser pre-amplifier, including analogue front-end, PLL data recovery, demodulation, and error correction.
The analogue front-end input converts the HF input to the digital domain via an 8-bit ADC, preceded by an AGC circuit to obtain the optimum performance from the converter. An external resonator clocks this block. This subsystem recovers the data from the channel stream. It corrects asymmetry, performs noise filtering and equalisation, and finally recovers the bit clock and data from the channel using a digital PLL.

The demodulator part detects the frame synchronisation signals and decodes the EFM (14 bit) and EFM+ (16 bit) data and sub-code words into 8-bit symbols. Via the serial output interface, the I2S data (audio and video) go to the DVD+RW interface (back-end).
The spindle-motor interface provides both motor control signals from the demodulator and, in addition, contains a tachometer loop that accepts tachometer pulses from the motor unit. They drive the motor IC (item 7301).
The SAA7831 has two independent microcontroller interfaces. The first is a serial I2C-bus and the second is a standard 8-bit multiplexed parallel interface. Both of these interfaces provide access to 32 8-bit registers for control and status.

Some HDR65 features:
- Playback speeds up to 48 x CD and 8 x DVD; recording up to 8 x CD and 4 x DVD
- Matched filter with digital equalizer, noise filter, and digital PLL.
- EFM and EFM+ modulator and demodulator.
- Decoding, de-interleaving, and error correction according to CD and DVD standards.
- Wobble processing for DVD-R(W) and CD.
- Motor control for CAV and CLV regulation on both recorded and unrecorded discs.
- Automated encode start/stop mechanism, supporting bit-accurate linking (only DVD).
- Write data/clock interface compatible with LADIC.
- Versatile serial input/output interface for different formats.
- 8 bit parallel data input/output interface.

9.5.4 AWESOME

The AWESOME gate array chip (uPD65882, item 7401) is a fully digital DVD+RW add-on for the HDR65. A combination of both ICs can do CD and DVD decoding and CD, DVD-R(W), and DVD+RW encoding. It contains logic for:
- Wobble processing:
  - Address detection,
  - Write clock generation,
  - Start and stop.
- ADIP decoding.
- Spindle motor control to do CLV on wobble.
- Link bits insertion (according to DVD+RW standard).
- Output to SPIDRE pre-processor for wobble-AGC

It also contains multiplexing logic for the motor signals and a merge of the internal serial bus to the analogue pre-processor (SPIDRE) with the serial bus of the HDR65.

Note: AWESOME stands for: Adip decoding, Wobble processing, Error correction, Synchronous start/stop and Occasionally Mend Errors.

Wobble

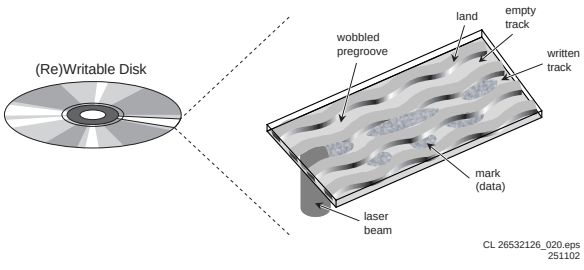


Figure 9-6 Pre-groove wobble on (re)writable discs

All **recordable** DVD media types feature a microscopic wobble groove embedded in the plastic substrate. This wobble provides the recorder with the timing information needed to place the data accurately on the disc. During recording, the drive's laser follows this groove, to ensure consistent spacing of data in a spiral track. The walls of the groove are modulated in a consistent sinusoidal pattern, so that a drive can read and compare it to an oscillator for precise rotation of the disc. This modulated pattern is called a *wobble groove*, because the walls of the groove appear to wobble from side to side. This signal is only used during recording, and therefore has no effect on the playback process. Among the DVD family of formats, only recordable media use wobble grooves.

For lossless linking it is necessary to write any data block in the correct position with high accuracy (within 1 micron). For this purpose the groove is mastered with a high wobble frequency (817 kHz at n=1), which ensures that the writing can be started and stopped at an accurately defined position. The writing clock as obtained from this groove is very accurate. At the same time, address information is stored in this wobbled groove by locally inverting the sign of the wobbled waveform.

Some characteristics:
- Only exists on (re)writable media.
- Pregroove wobble-detector present in recorders.
- Pregroove wobble-detector not present in players.
- Wobble-frequency is different for different standards:
  - DVD+R(W): 820 kHz
  - DVD-R(W), DVD-RAM: 141 kHz
- The wobble is phase modulated by inverting wobble cycles.
- The information contained in the wobble modulation is called Address-in-Pregroove or ADIP.

9.5.5 Power Supply

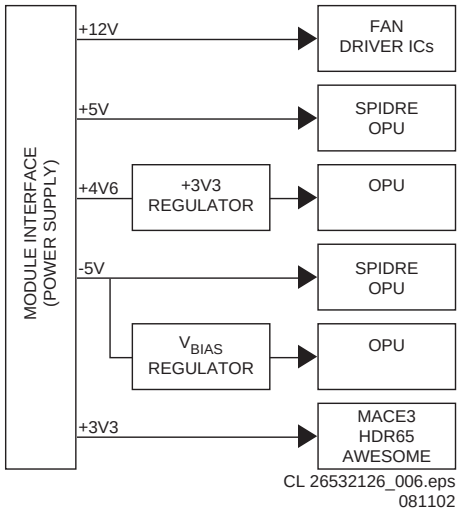


Figure 9-7 Power supply overview

The main power supplies to the module are 3.3 V, 5 V, and 12 V (input via connector 1000).
The MACE3, HDR65, and AWESOME ICs use the 3.3 V.
An on-board linear regulator is used to generate the -1.5 V required by the laser (V_{BIAS}). The other on-board linear regulator is used to generate the 3V3E required by the OPU.
The SPIDRE and OPU use the +5 V and -5 V. The motor, fan, and servo drivers use the 12 V.

Power 'on' reset
At power 'on', a reset IC (AMD810, item 7201) generates a positive reset pulse of typicac 240 ms. As a result, the micro program will receive a reset, and the data of the Flash ROM is copied into the uP-RAM.
When the MACE IC is reset, also the HDR65 (SAA7831, item 7402) and AWESOME (uPD65882, item 7401) will get a reset via the 'SYS-RSTn', an output signal from the MACE.

9.5.6 PWB connections

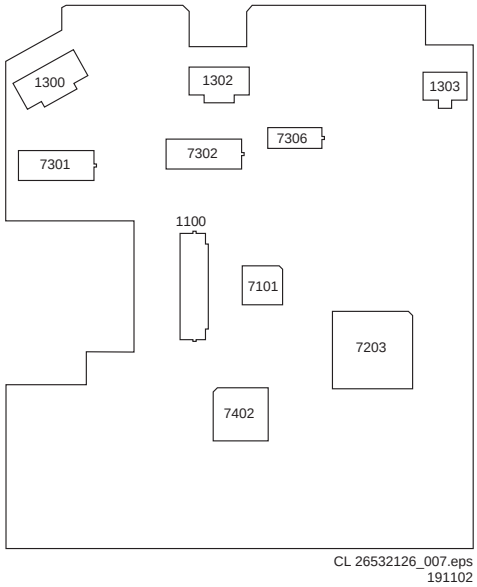


Figure 9-8 A-side connections

- OPU-64: 45 pins flex foil (item 1100).
- Disk motor and hall elements: 11 pins flex foil (item 1300).
- Sledge motor and hall output: 8 pins flex foil (item 1302).
- Tilt motor: 4 pins flex foil (item 1303).

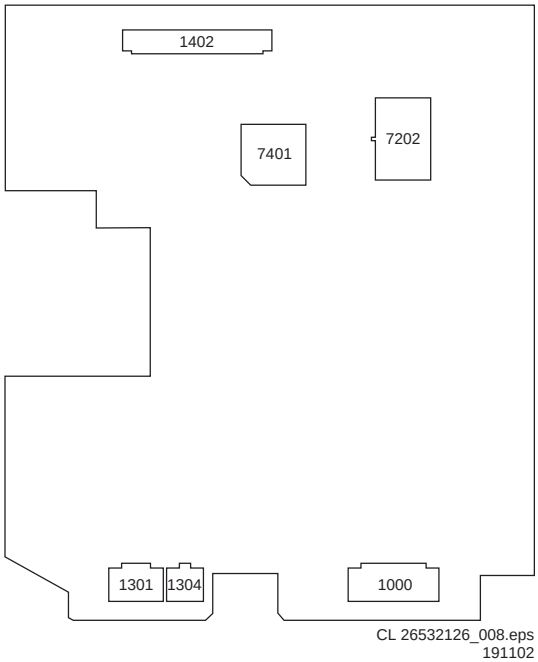


Figure 9-9 Z-side connections

- Tray motor: 4 pins wired (item 1301).
- Fan: 2 pins wired (item 1304).
- Digital PWB (back-end): 30 pins flex foil (item 1402).
- Power supply: 8 pins wired (item 1000).

9.6 Abbreviation list

ADC	Analogue to Digital Converter
ADIP	ADdress In Pre-groove
AGC	Automatic Gain Control
CD	Compact Disc
CLV	Constant Linear Velocity
DROPPI	Dvd Rewritable Opu Pre-Processor IC
AM	Amplitude Modulation
BE	Basic Engine
ComPair	Computer aided rePair
CD-DA	CD Digital Audio
CS	Chip Select
DAC	Digital to Analogue Converter
DAIO	Digital Audio Input Output
DENC	Digital Encoder
DFU	Direction For Use: description for the end user
DNR	Dynamic Noise Reduction
DRAM	Dynamic RAM
DSD	Direct Stream Digital
DSP	Digital Signal Processing
DVD	Digital Versatile Disc
EEPROM	Electrical Erasable Programmable ROM
EFM	Eight to Fourteen bit Modulation
FDS	Full Diagnostic Software
HF	High Frequency
I2C	Integrated Ic bus (signals at 5V level)
I2S	Integrated Ic Sound bus (signals at 3.3V level)
IC	Integrated Circuit
IF	Intermediate Frequency
IRQ	Interrupt ReQuest
LADIC	LAser Driver IC
LLD	Loss Less Decoder
LPCM	Linear Pulse Code Modulation
LRCLK	Left/Right CLocK
MACE	Mini All Cd Engine
MPEG	Motion Pictures Experts Group
NC	Not Connected
NVM	Non Volatile Memory: IC containing DVD related data e.g. alignments
OPC	Optimum Power Calibration
OPU	Optical Pickup Unit
PCB	Printed Circuit Board (see PWB)
PCS	Position Control Sledge
PLL	Phase Locked Loop
PCM	Pulse Code Modulation
PCM_CLK	Audio system clock for DAC
PCM_OUTx	Audio serial output data
PSU	Power Supply Unit
PWB	Printed Wiring Board (see PCB)
RAM	Random Access Memory
RGB	Red, Green and Blue colour space
ROM	Read Only Memory
RF	Radio Frequency
S2B	Serial to Basic engine, communication bus between host- and servo processor
SCL	Serial Clock I2C
SCLK	Audio serial bit clock
SDA	Serial Data I2C
SDRAM	Synchronous DRAM
SMC	Surface Mounted Components
S/PDIF	Sony Philips Digital InterFace
SPIDRE	Signal Processing Ic for Dvd REwritable
SRAM	Static Random Access Memory
STBY	STandBY
SVCD	Super Video CD
SW	SoftWare
THD	Total Harmonic Distortion
TTL	Transistor Transistor Logic (5V logic)
uP	Microprocessor
VCD	Video CD
Y/C	Luminance (Y) and Chrominance (C) signal
YUV	Component video

9.7 IC Data Sheets

In this paragraph, the internal block diagrams and pinning are given of ICs that are drawn as a 'black box' in the electrical diagrams (with the exception of 'memory' and 'logic' ICs).

9.7.1 Diagram 2, SAA7830 (IC7203)

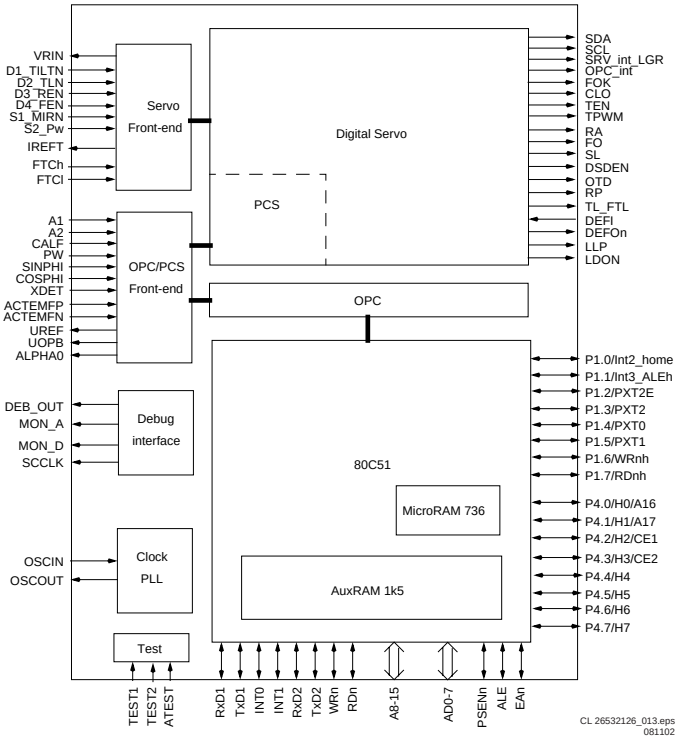


Figure 9-10 Internal Block Diagram MACE3

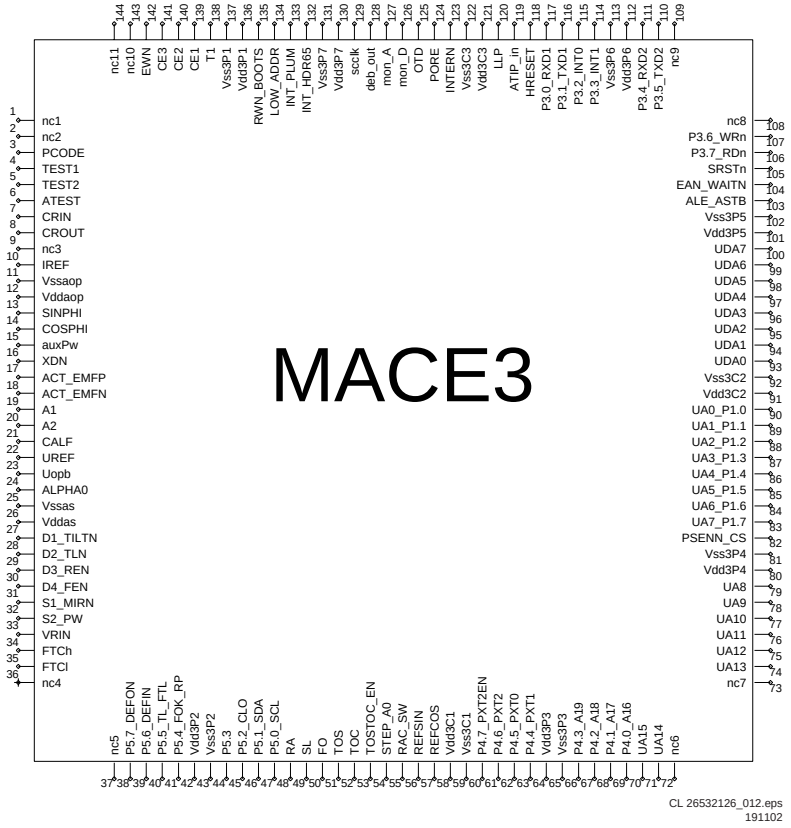
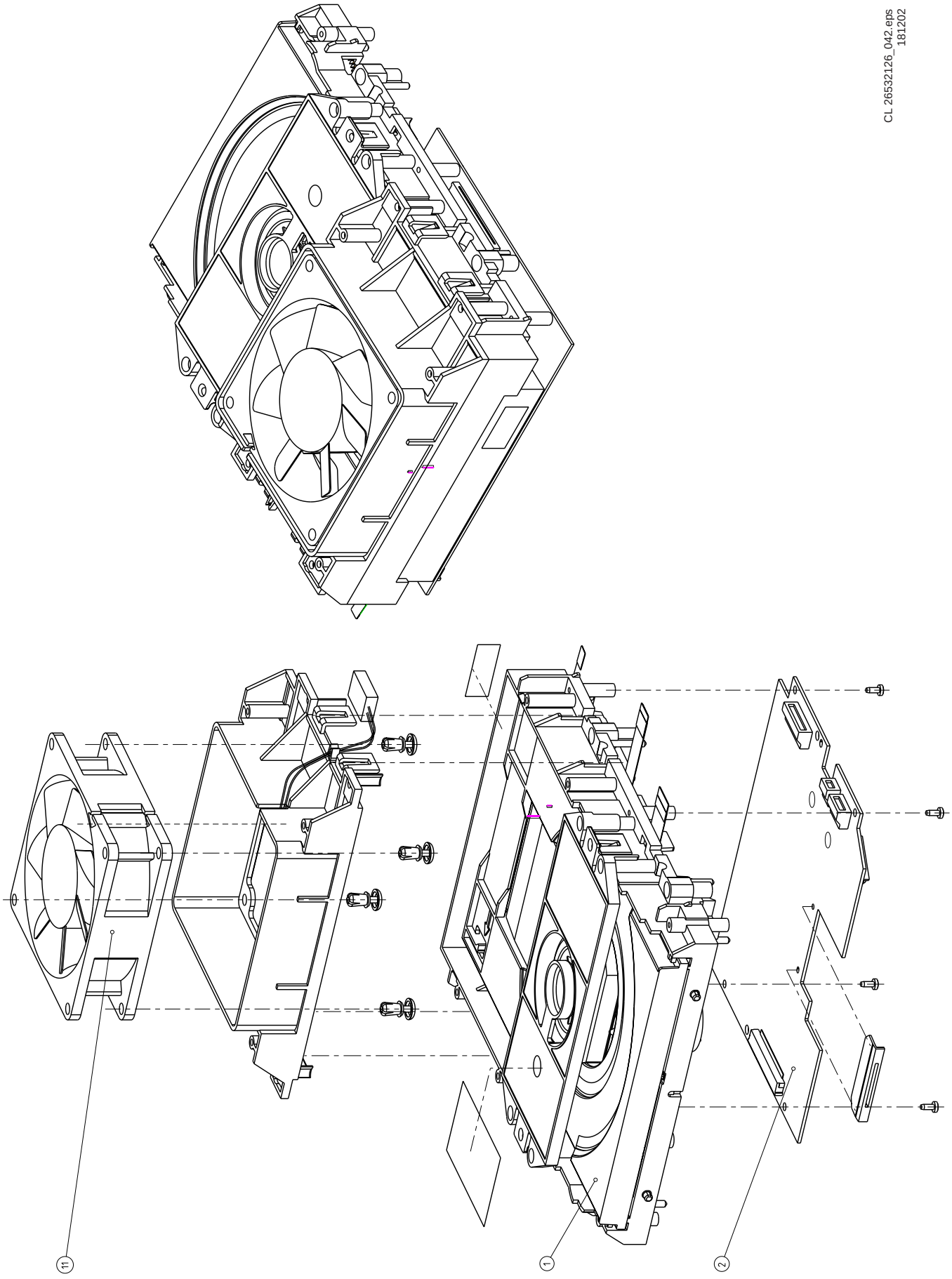


Figure 9-11 Pinning MACE3

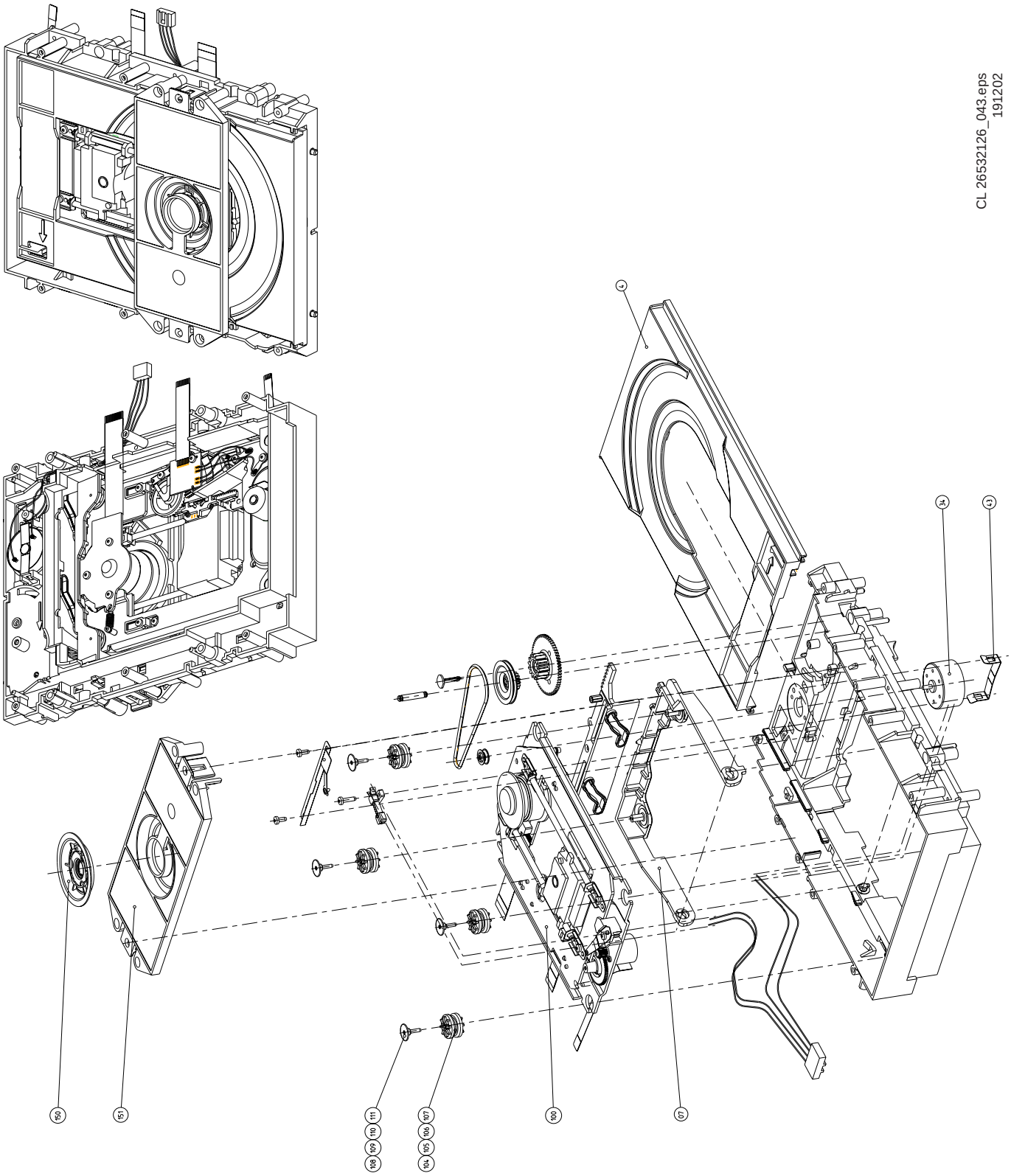
10. Spare Parts List

10.1 Exploded Views

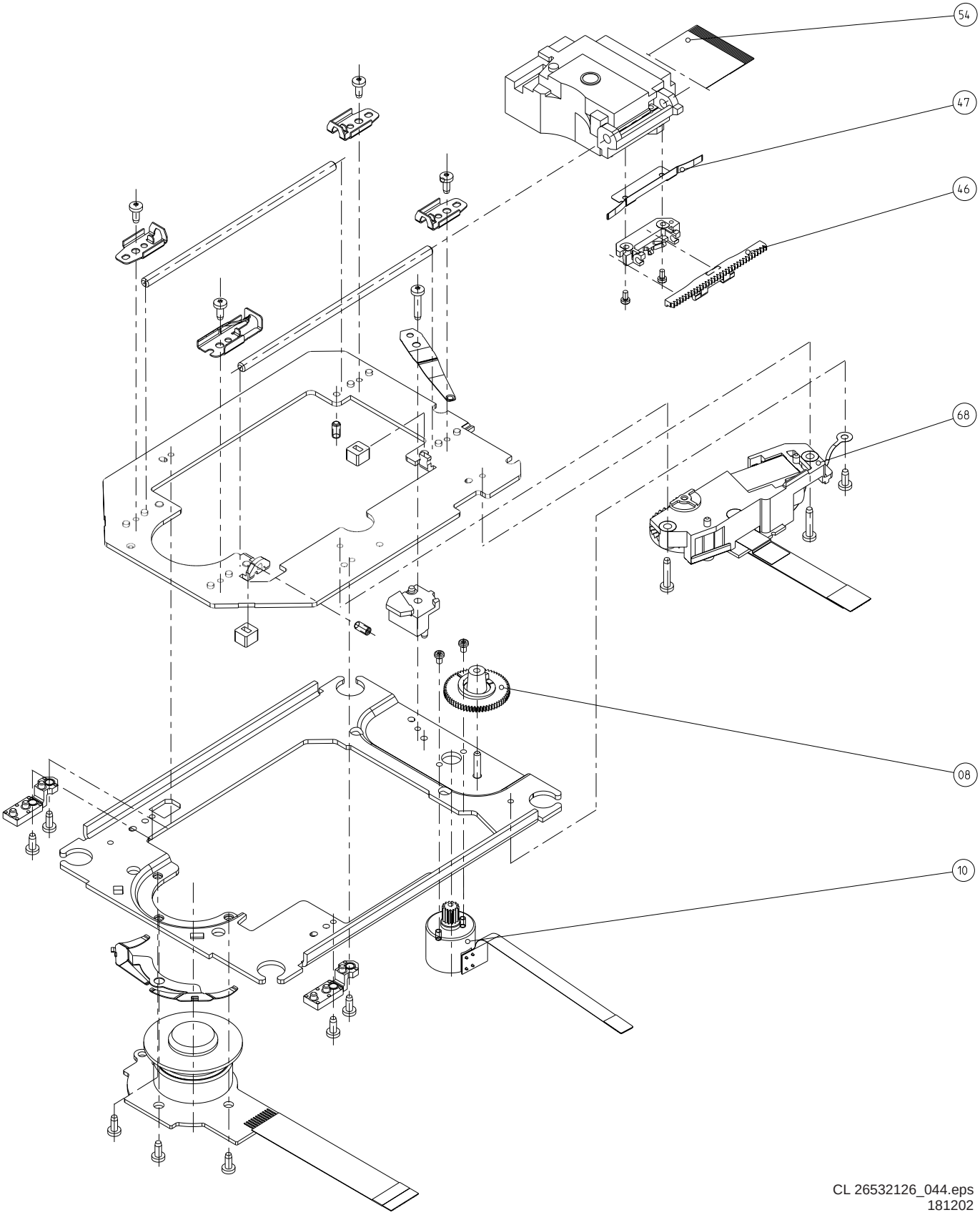
Basic Engine



Loader


CL 26532126_043.eps
191202
1
14
13
150
151
111
110
109
108
107
106
105
104
100
101

DVD-M



CL 26532126_044.eps
181202

Miscellaneous

Various

0000	7104 099 28362	SUB CHASSIS 8 TEST CD
0000	7104 099 91691	MPTD PRINTED TEST DISC CVP02.18A
0000	7104 099 97941	MPTD PRINTED TEST DISC CVP02.18C
0000	7104 099 91041	BURN-IN TEST DISC DL LVP04.15
0000	7104 099 97931	MPTD THIN TEST DISC CVP02.60
0000	7104 099 98502	NLT 01.00 LINK TEST DISC DVDROM SETTINGS
0000	7104 099 98582	BLANK DVD+RW DISC RICOH
0000	7104 099 94001	BLANK DVD+R DISC RICOH

Mechanical Parts

Various

0001	3104 147 17471	LOADER ASSY
0008	3104 144 07200	TILT GEAR
0010	3104 148 01520	TILT MOTOR ASSY
0011	3104 148 01780	FAN
0011	3104 148 02051	LOW HEIGHT FAN VAE8020/15
0034	3104 148 01960	LOADING TRAY MOTOR
0046	3104 144 07244	OPU RACK SLEDGE
0047	3104 141 22833	OPU RACK SPRING
0052	3104 141 23380	TILT BLADE SPRING
0054	3104 157 12392	OPU FLEX
0068	3104 147 17481	SLEDGE MOTOR ASSY
0100	9305 022 82001	DVDM/01, LADIC M3,OPU6464.3 EU
0100	9305 022 82002	DVDM/02, LADIC M3,OPU6464.4 US
0100	9305 022 82015	DVDM/15, LADIC M4,OPU6411.1 plastic lens
0104	3104 144 06540	SUSPENSION
0105	3104 144 06540	SUSPENSION
0106	3104 144 06540	SUSPENSION
0107	3104 144 06540	SUSPENSION
0108	3104 140 40650	DVDM MOUNTING SCREW
0109	3104 140 40650	DVDM MOUNTING SCREW
0110	3104 140 40650	DVDM MOUNTING SCREW
0111	3104 140 40650	DVDM MOUNTING SCREW

Electrical Parts

Various

0000	2422 025 17276	S2B CONNECTOR
1100	2422 025 17751	CON BM H 45P F 0.5 FFC 0.3 R
1201	2422 540 98428	RESONATOR 8.467MHz
1300	4822 267 51454	CONN. 11P FEMALE
1302	2422 025 16158	CON BM H 8P F 1.00 FFC 0.3 R
1303	2422 025 17427	CON BM H 4P F 1.00 FFC 0.3 R
1401	2422 540 98428	RESONATOR 8.467MHz
1402	2422 025 17276	CON BM H 30P F 1.00 FFC SMT R

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2002	5322 126 11583	10nF 10% 50V 0603
2003	4822 124 23002	10µF 16V
2004	5322 126 11583	10nF 10% 50V 0603
2005	4822 124 23002	10µF 16V
2008	5322 126 11583	10nF 10% 50V 0603
2009	4822 124 23002	10µF 16V
2010	5322 126 11583	10nF 10% 50V 0603
2011	4822 124 23002	10µF 16V
2012	5322 126 11583	10nF 10% 50V 0603
2013	4822 124 23002	10µF 16V
2014	4822 124 12084	1µF 20% SM 50V
2015	2238 586 59812	0603 50V 100NP80M
2016	4822 124 23002	10µF 16V
2017	5322 126 11583	10nF 10% 50V 0603
2018	2238 586 59812	0603 50V 100NP80M
2019	4822 124 23002	10µF 16V
2020	2238 586 59812	0603 50V 100NP80M
2100	2238 586 59812	0603 50V 100NP80M
2101	5322 126 11583	10nF 10% 50V 0603
2102	2238 586 59812	0603 50V 100NP80M
2104	5322 126 11583	10nF 10% 50V 0603
2105	5322 126 11583	10nF 10% 50V 0603
2106	4822 122 33735	27nF 10% 63V
2110	2238 586 59812	0603 50V 100NP80M
2111	2238 586 59812	0603 50V 100NP80M
2116	2238 586 59812	0603 50V 100NP80M
2121	5322 126 11579	3.3nF 10% 63V
2122	5322 126 11582	6.8nF 10% 63V
2125	5322 126 11583	10nF 10% 50V 0603
2127	5322 126 11583	10nF 10% 50V 0603
2200	2238 586 59812	0603 50V 100NP80M
2202	2238 586 59812	0603 50V 100NP80M
2203	4822 124 23002	10µF 16V
2207	3198 017 44740	0603 10V 470nF COL
2208	2238 586 59812	0603 50V 100NP80M
2209	2238 586 59812	0603 50V 100NP80M
2210	2238 586 59812	0603 50V 100NP80M
2211	2238 586 59812	0603 50V 100NP80M
2212	5322 126 11583	10nF 10% 50V 0603
2214	2238 586 59812	0603 50V 100NP80M
2218	2238 586 59812	0603 50V 100NP80M
2219	2238 586 59812	0603 50V 100NP80M
2220	2238 586 59812	0603 50V 100NP80M
2221	2238 586 59812	0603 50V 100NP80M
2222	2238 586 59812	0603 50V 100NP80M
2223	2238 586 59812	0603 50V 100NP80M
2224	2238 586 59812	0603 50V 100NP80M
2225	2238 586 59812	0603 50V 100NP80M
2226	2238 586 59812	0603 50V 100NP80M
2227	2238 586 59812	0603 50V 100NP80M
2228	2238 586 59812	0603 50V 100NP80M
2232	2238 586 59812	0603 50V 100NP80M
2233	4822 122 33753	150pF 5% 50V
2234	4822 122 33753	150pF 5% 50V
2300	5322 126 11583	10nF 10% 50V 0603
2301	4822 124 23002	10µF 16V
2302	3198 017 34730	0603 16V 47nF COL
2303	3198 030 74780	EL SM 35V 4U7 PM20 COL R
2304	5322 126 11583	10nF 10% 50V 0603
2305	4822 124 23002	10µF 16V
2309	3198 016 31020	0603 25V 1nF
2310	3198 016 31020	0603 25V 1nF
2311	4822 126 14494	22nF 10% 25V 0603
2312	2238 786 11554	0603 16V 2N2 PM5 R
2313	2238 586 59812	0603 50V 100NP80M
2314	3198 016 31020	0603 25V 1nF
2315	2238 586 59812	0603 50V 100NP80M
2316	2238 586 59812	0603 50V 100NP80M
2317	5322 126 11583	10nF 10% 50V 0603
2318	3198 016 31020	0603 25V 1nF
2319	2238 586 59812	0603 50V 100NP80M
2320	3198 016 31020	0603 25V 1nF
2321	3198 016 31020	0603 25V 1nF
2322	2238 586 59812	0603 50V 100NP80M
2323	4822 126 14494	22nF 10% 25V 0603
2324	5322 124 41945	22µF 20% 35V
2325	2238 586 59812	0603 50V 100NP80M
2326	3198 017 31530	0603 50V 15nF COL R
2327	2238 586 59812	0603 50V 100NP80M
2328	3198 017 31530	0603 50V 15nF COL R
2329	2238 586 59812	0603 50V 100NP80M
2331	2238 586 59812	0603 50V 100NP80M
2332	2238 586 59812	0603 50V 100NP80M
2333	5322 124 41945	22µF 20% 35V
2334	2238 586 59812	0603 50V 100NP80M
2335	2238 786 11554	0603 16V 2N2 PM5 R
2336	3198 017 34730	0603 16V 47nF COL
2337	3198 017 34730	0603 16V 47nF COL
2338	2238 786 11554	0603 16V 2N2 PM5 R
2339	4822 124 23002	10µF 16V
2400	4822 124 23002	10µF 16V
2401	5322 126 11583	10nF 10% 50V 0603
2402	2238 586 59812	0603 50V 100NP80M
2405	2238 586 59812	0603 50V 100NP80M
2406	2238 586 59812	0603 50V 100NP80M
2407	2238 586 59812	0603 50V 100NP80M
2409	2238 586 59812	0603 50V 100NP80M
2413	2238 586 59812	0603 50V 100NP80M
2414	2238 786 11554	0603 16V 2N2 PM5 R
2421	4822 122 33761	22pF 5% 50V
2422	2238 586 59812	0603 50V 100NP80M
2423	2238 586 59812	0603 50V 100NP80M
2424	2238 586 59812	0603 50V 100NP80M
2425	2238 586 59812	0603 50V 100NP80M
2426	2238 586 59812	0603 50V 100NP80M
2427	2238 586 59812	0603 50V 100NP80M
2428	2238 586 59812	0603 50V 100NP80M
2429	2238 586 59812	0603 50V 100NP80M
2430	2238 586 59812	0603 50V 100NP80M
2431	2238 586 59812	0603 50V 100NP80M
2432	2238 586 59812	0603 50V 100NP80M
2434	4822 122 33741	10pF 10% 50V
2435	4822 122 33761	22pF 5% 50V
2436	4822 122 33761	22pF 5% 50V
2437	4822 122 33761	22pF 5% 50V
2438	4822 122 33761	22pF 5% 50V
2439	4822 122 33761	22pF 5% 50V
2440	4822 122 33761	22pF 5% 50V
2441	4822 122 33761	22pF 5% 50V
2446	5322 126 11583	10nF 10% 50V 0603
2447	2238 586 59812	0603 50V 100NP80M

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3000	4822 051 30479	47Ω 5% 0.062W
3005	4822 051 30121	120Ω 5% 0.062W
3006	2322 704 64309	RST SM 0603 RC22H 43Ω PM1
3100	4822 051 30103	10k 5% 0.062W
3101	4822 051 30103	10k 5% 0.062W
3103	5322 117 13029	47k 1% 0.063W 0603 RC22H
3105	4822 051 30681	680Ω 5% 0.062W
3107	4822 051 30101	100Ω 5% 0.062W
3108	4822 051 30101	100Ω 5% 0.062W
3114	4822 051 30101	100Ω 5% 0.062W
3115	4822 051 30101	100Ω 5% 0.062W
3121	4822 051 30681	680Ω 5% 0.062W
3122	4822 051 30152	1k5 5% 0.062W
3129	4822 051 30154	150k 5% 0.062W
3130	4822 051 30101	100Ω 5% 0.062W
3132	4822 117 12917	1Ω 5% 0.062W CASE0603
3200	4822 051 30103	10k 5% 0.062W
3201	4822 051 30103	10k 5% 0.062W
3204	4822 117 12917	1Ω 5% 0.062W CASE0603
3205	4822 051 30103	10k 5% 0.062W
3210	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3214	4822 051 30103	10k 5% 0.062W
3216	4822 051 30103	10k 5% 0.062W
3217	4822 051 30103	10k 5% 0.062W
3221	4822 051 30472	4k7 5% 0.062W
3222	4822 051 30103	10k 5% 0.062W
3224	4822 051 30105	1M 5% 0.062W
3225	4822 051 30331	330Ω 5% 0.062W
3226	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3227	4822 117 13525	24k 1% 0.62W RC22H 0603
3231	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3235	4822 051 30103	10k 5% 0.062W
3236	4822 051 30103	10k 5% 0.062W
3237	4822 051 30223	22k 5% 0.062W
3238	4822 051 30222	2k2 5% 0.062W
3241	4822 051 30103	10k 5% 0.062W
3244	4822 051 30103	10k 5% 0.062W
3245	4822 051 30472	4k7 5% 0.062W
3246	4822 051 30479	47Ω 5% 0.062W
3249	4822 051 30103	10k 5% 0.062W
3250	4822 051 30479	47Ω 5% 0.062W
3251	4822 051 30222	2k2 5% 0.062W
3252	4822 051 30222	2k2 5% 0.062W
3253	4822 051 30273	27k 5% 0.062W
3254	4822 051 30273	27k 5% 0.062W
3255	4822 051 30273	27k 5% 0.062W
3256	4822 051 30273	27k 5% 0.062W
3257	4822 051 30273	27k 5% 0.062W
3258	4822 051 30273	27k 5% 0.062W
3259	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3260	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3261	4822 051 30103	10k 5% 0.062W
3262	4822 117 11817	1k2 1% 1/16W
3264	4822 117 13632	100k 1% 0603 0.62W
3265	4822 117 13632	100k 1% 0603 0.62W
3266	4822 051 30103	10k 5% 0.062W
3267	4822 051 30103	10k 5% 0.062W
3268	4822 051 30103	10k 5% 0.062W
3269	4822 051 30102	1k 5% 0.062W
3270	4822 051 30102	1k 5% 0.062W
3271	4822 051 30102	1k 5% 0.062W
3272	4822 051 30103	10k 5% 0.062W
3274	4822 051 30103	10k 5% 0.062W
3275	4822 051 30103	10k 5% 0.062W
3276	4822 051 30103	10k 5% 0.062W
3277	4822 051 30102	1k 5% 0.062W
3300	4822 051 30272	2k7 5% 0.062W
3302	4822 051 30272	2k7 5% 0.062W
3303	4822 051 30102	1k 5% 0.062W
3304	4822 051 30102	1k 5% 0.062W
3305	4822 117 13608	4.7Ω 5% 0603 0.0016W
3307	5322 117 13068	82Ω 1% 0.063W 0603 RC22H
3308	4822 051 20108	1Ω 5% 0.1W
3309	4822 051 20108	1Ω 5% 0.1W
3310	4822 117 12917	1Ω 5% 0.062W CASE0603
3311	4822 117 12917	1Ω 5% 0.062W CASE0603
3312	4822 117 12917	1Ω 5% 0.062W CASE0603
3314	4822 051 20108	1Ω 5% 0.1W

3315	4822 051 20108	1Ω 5% 0.1W
3316	4822 051 20228	2Ω2 5% 0.1W
3317	4822 051 20228	2Ω2 5% 0.1W
3318	4822 051 20228	2Ω2 5% 0.1W
3319	4822 051 20228	2Ω2 5% 0.1W
3320	4822 051 30332	3k3 5% 0.062W
3321	4822 051 30563	56k 5% 0.062W
3323	4822 051 30222	2k2 5% 0.062W
3324	5322 117 13049	470Ω 1% 0.063W 0603 RC22H
3325	5322 117 13049	470Ω 1% 0.063W 0603 RC22H
3326	5322 117 13049	470Ω 1% 0.063W 0603 RC22H
3327	4822 051 30103	10k 5% 0.062W
3328	5322 117 13049	470Ω 1% 0.063W 0603 RC22H
3329	4822 117 13632	100k 1% 0603 0.62W
3330	4822 051 30332	3k3 5% 0.062W
3331	4822 051 30103	10k 5% 0.062W
3332	2322 704 62003	RST SM 0603 RC22H 20k PM1 R
3335	5322 117 13068	82Ω 1% 0.063W 0603 RC22H
3336	4822 117 12864	82k 5% 0.6W
3337	4822 051 30273	27k 5% 0.062W
3338	4822 051 30103	10k 5% 0.062W
3339	4822 117 12864	82k 5% 0.6W
3340	4822 051 30332	3k3 5% 0.062W
3341	4822 051 30102	1k 5% 0.062W
3342	4822 051 30273	27k 5% 0.062W
3343	4822 051 30103	10k 5% 0.062W
3344	4822 051 30332	3k3 5% 0.062W
3345	4822 051 30102	1k 5% 0.062W
3346	5322 117 13049	470Ω 1% 0.063W 0603 RC22H
3347	5322 117 13049	470Ω 1% 0.063W 0603 RC22H
3348	4822 117 13632	100k 1% 0603 0.62W
3351	4822 051 30472	4k7 5% 0.062W
3352	4822 051 30153	15k 5% 0.062W
3353	4822 051 30123	12k 5% 0.062W
3354	4822 117 11817	1k2 1% 1/16W
3355	4822 051 30332	3k3 5% 0.062W
3356	4822 051 30472	4k7 5% 0.062W
3357	4822 117 13632	100k 1% 0603 0.62W
3358	4822 051 30102	1k 5% 0.062W
3359	2322 704 62002	RST SM 0603 RC22H 2k PM1 R
3361	4822 051 30563	56k 5% 0.062W
3362	4822 051 30103	10k 5% 0.062W
3364	4822 051 30272	2k7 5% 0.062W
3365	4822 051 30272	2k7 5% 0.062W
3367	4822 051 30471	470Ω 5% 0.062W
3369	4822 051 30471	470Ω 5% 0.062W
3370	4822 051 30103	10k 5% 0.062W
3400	4822 117 11817	1k2 1% 1/16W
3401	2350 035 10152	RST NETW SM ARV24 4X1k5 PM5 R
3407	4822 117 13525	24k 1% 0.62W RC22H 0603
3408	4822 051 30103	10k 5% 0.062W
3409	4822 051 30103	10k 5% 0.062W
3410	2350 035 10152	RST NETW SM ARV24 4X1k5 PM5 R
3415	4822 051 30101	100Ω 5% 0.062W
3416	4822 051 30105	1M 5% 0.062W
3417	4822 051 30331	330Ω 5% 0.062W
3418	4822 117 13578	4X10k 5% MNR14
3419	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3420	2350 035 91001	RST NETW SM ARV24 4X jumper R
3430	4822 117 13578	4X10k 5% MNR14
3431	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3439	4822 051 30109	10Ω 5% 0.062W
3440	4822 051 30109	10Ω 5% 0.062W
3448	2350 035 91001	RST NETW SM ARV24 4X jumper R
3449	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3450	4822 117 13573	NETW 4 X 47Ω 5% MNR14
3451	4822 117 11817	1k2 1% 1/16W
3463	4822 051 30101	100Ω 5% 0.062W
3468	4822 051 30101	100Ω 5% 0.062W
3469	4822 051 30101	100Ω 5% 0.062W
3470	4822 051 30102	1k 5% 0.062W
3471	4822 117 12925	47k 1% 0.063W 0603

5100	2422 549 43303	ADJ.COIL (100µH +/-6%)
5102	2422 549 43303	ADJ.COIL (100µH +/-6%)
5104	2422 549 43303	ADJ.COIL (100µH +/-6%)
5201	2422 549 43769	IND FXD SM EMI 100mH z 30R R
5202	2422 549 43769	IND FXD SM EMI 100mH z 30R R
5300	2422 549 43769	IND FXD SM EMI 100mH z 30R R
5301	2422 549 43769	IND FXD SM EMI 100mH z 30R R
5302	2422 549 43769	IND FXD SM EMI 100mH z 30R R
5400	2422 549 43303	ADJ.COIL (100µH +/-6%)
5401	2422 549 43769	IND FXD SM EMI 100mH z 30R R
5402	2422 549 43769	IND FXD SM EMI 100mH z 30R R

6301	4822 130 11397	BAS316

7000	9322 150 89668	IC SM LM337D2T (ONSE) R
7001	9322 121 67668	IC SM LF33CD (ST00) R
7101	9352 688 06157	IC SM TZA1031HL (PHSE) Y
7200	4822 130 60373	BC856B
7201	9322 155 26685	IC SM ADM810SART (ANA0) Y
7202	9965 000 16590	FLASH FW15.07.xx VAE8010,8015
7202	9965 000 16595	FLASH FW20.09.xx VAE8020/01/02
7202	9965 000 16596	FLASH FW20.01.xx VAE8020/03
7202	9965 000 16597	FLASH FW20.02.xx VAE8020/05
7202	9965 000 20216	FLASH FW20.03.xx VAM/15
7203	9352 687 34557	IC SM SAA7830HL (PHSE) Y
7204	9322 036 99685	IC SM CY7C1399B-15ZC (CYPR) R
7205	4822 130 60373	BC857B
7301	9322 139 85668	BA6665FM
7302	4822 209 17229	BA5938FM
7304	4822 209 30095	LM833D
7306	9322 166 66668	IC SM BA5944FP (RHM0) R
7308	9340 547 21215	FET POW SM BSH205 (PHSE) R
7309	5322 130 60159	BC846B
7310	5322 130 60159	BC846B
7311	5322 130 60159	BC846B
7312	9322 144 97668	IC SM LD1117DT (ST00) R
7401	9322 180 17671	IC SM AWESOME2 (NEC0) Y
7401	9322 189 16671	IC SM AWESOME3 (NEC0) Y
7402	9352 687 36557	IC SM SAA7831HL (PHSE) Y

11. Revision List

11.1 3122 785 12471

- December 12 2002
  1. New partslist added in chapter 10

11.2 3122 785 12472

- December 20 2002
  1. Configuration matrix table added in chapter 2
  2. Exploded views added in chapter 4
  3. Parts list adepted in chapter 10

11.3 3122 785 12473

- July 2003
  1. PCB Layout 123 43661 added